

# PAVEMENT MANAGEMENT MANUAL

State of Vermont  
Agency of Transportation

# Pavement Management Manual

Vermont  
Agency of  
Transportation

# **Pavement Management Manual**

**1998**

**State of Vermont  
Agency of Transportation**

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# Organization and Administration

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## 1.1 MISSION AND SCOPE OF RESPONSIBILITY

### 1.1.1 Mission

The mission of the Pavement Management Section is to preserve and improve the pavement condition level, within the limits of funds available, on State highways, Interstate highways, and Class 1 town highways.

### 1.1.2 Scope of Responsibility

The Section defines appropriate resurfacing work on the highways, both by contract and force account, and manages the funds appropriated for paving. Its responsibilities include data collection and research, network analysis and project selection, and production of project construction plans.

## 1.2 ORGANIZATION

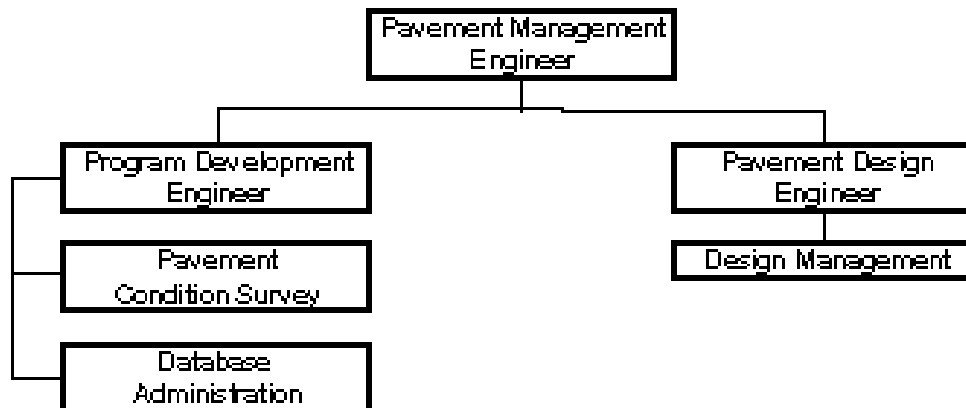
The Pavement Management Section is a part of the Construction and Maintenance Division. The Section head is the Pavement Management Engineer, who is supported by a staff of engineers and technicians in two primary subsections, Program Development and Project Design. The Pavement Management Engineer reports directly to the Director of the Construction and Maintenance Division. The Section organization chart is shown in Figure 1-1.

## 1.3 RESPONSIBILITY

The Pavement Management Section is responsible for the full range of program delivery tasks and, with a program financial management capability, it becomes a virtual stand-alone program-delivery unit. It has assistance from agency-level support services, including accounting, human resources, bid letting, and project construction inspection. The two functional units carry out the responsibilities of the Section.



Figure 1-1. Pavement Management Functional Organization



### 1.3.1 Program Development

The Program Development Unit is responsible for evaluating network pavement condition and selecting a series of future projects based on anticipated funding levels. The project schedules avoid interference with work planned by other Agency programs. The number or value of projects varies with the amount of funds appropriated on an annual basis. The program development procedures accept projects identified as resurfacing candidates by the system planning process in the Agency's Policy and Planning Division.

### 1.3.2 Project Design

The Project Design Unit is responsible for managing design consultants engaged in developing contract plans in a consecutive series of annual programs, ready for construction.

### 1.3.3 Management and Administration

The Pavement Management Engineer has the responsibility and authority to complete all duties and tasks of the Section. The Engineer is responsible to ensure that both technical and administrative functions occur efficiently and effectively. The technical functions are described in detail in the remaining parts of this manual.

The Engineer's primary management functions and the associated administrative tasks are in the appendix.

## 1.4 GOALS

### 1.4.1 Section Goals

The Pavement Management Section has two goals, each defined and supported by specific objectives.

- *Goal 1.* To enhance network condition for all users. Objectives:
  - Ensure that not more than 20 percent of vehicle-miles traveled are on highways in poor condi-

tion.

- Incorporate appropriate safety standards in all paving projects.
  - Satisfy various user benefits and interests through balanced design objectives.
  - Ensure that all designs are consistent with Agency goals regarding multimodalism.
  - Acknowledge the current condition of the existing network.
  - Define and ensure full implementation and operation of the preventive maintenance program.
- *Goal 2.* To manage the paving program effectively. Objectives:
- Document and convey resource needs.
  - Ensure appropriate and effective use of all paving funds.
  - Ensure employees have ample opportunities to expand knowledge and skills.
  - Expand production capabilities through effective use of other AOT staff.
  - Ensure that all contract plan work is completed on time and comprehensively to accomplish program paving efficiently and effectively.
  - Ensure that data collection needs of other divisions are met.

The Section's goals, objectives, and strategies were developed in a strategic planning effort and published in the strategic plan for the Construction and Maintenance Division in July 1994. The strategic planning effort is necessarily continuous because it must be responsive to changes in the Section's environment. The Section's goals, objectives, and strategies are modified periodically as indicated by the strategic planning process.

#### 1.4.2 Unit Goals

- The Program Development Unit has the goal of developing lists of projects (programs) that are timely and well coordinated with all other Agency activities.
- The Project Design Unit has the goal of developing contract plans and specifications that are timely to take advantage of all available funds.

### 1.5 HUMAN RESOURCES

Due to limited staffing, the Pavement Management Section relies on consulting engineering firms to provide much of its essential labor and technical support. These firms provide the following services:

- Condition inspection, including skid testing
- Project design, including environmental clearances
- Shop drawing review

Firms are employed on retainer contracts extending over a three- or four-year term. During the term

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the Section may call on the consultant to perform services as needed to support program development and project design.

The Program Development Engineer is responsible for consultant tasking and administering the condition inspection contracts. The Pavement Design Engineer is responsible for consultant tasking and administering the project design and shop-drawing review contracts.

The general procedures and responsibilities related to engaging consultants and administering their contracts are in the Agency publications *Policy and Procedures for Consultant Selection and Contract Processing* and *Guidance for Procurement Contracts, Grants, and Cooperative Agreements*. Typical scope statements for requests for proposals (RFP) for both design services and condition survey are in the appendix.

## **1.6 FUNDING**

### **1.6.1 Funding Sources**

Funds managed by the Pavement Management Section are primarily federal funds augmented by the necessary State matching funds. Federal funding categories may be Interstate 4R Construction (IM), National Highway System (NHS), or State Transportation Program (STP). Matching requirements are ten percent for the IM funds and twenty percent for the other categories.

The Section attempts to make the best use of federal funds, which are exclusively for contracted work awarded through competitive bids. If State funds are available, the work is occasionally done with State forces on a force-account basis or through a grant to a municipality.

### **1.6.2 Funding Procedure**

#### **1.6.2.1 Long-Range Projections**

Program funding guidance is published in the Agency's *Long-Range Plan*. The Agency's Budget Officer and Programming Engineer are also good sources for long-range funding information. Funding is not firm for an annual program of projects until appropriation action by the General Assembly. However, the Capital Program and the State Transportation Improvement Program (STIP) provide some reliable guidance.

The Agency's *Capital Program and Project Development Plan*, which is an annual report to the General Assembly, suggests annual funding levels for the major programs extending five years into the future. The STIP indicates specific projects on which federal funds are committed three years into the future. In the STIP, projects are listed according to the federal program category selected by the Agency's Programming Engineer. Paving projects are listed individually, except that the preliminary engineering (PE) for the STP and NH projects are separate lump sums.

#### **1.6.2.2 Appropriations Process**

The appropriated State funds are available on July 1 for the next fiscal year. The appropriation process for the next year begins shortly after the beginning of the current fiscal year, when the State Administration provides budget targets to the Agency's Budget Officer. The Budget Officer provides the target for paving, usually in August of each year. Target amounts indicate both federal and State funds for use in the category of Other, with no split into Personal Services and Operating Expenses. The Agency makes a budget proposal to the General Assembly in early January. The ap-

proved budget, which may be different from that proposed, is usually appropriated in the next April for the ensuing fiscal year.

Funds are appropriated in the Other category and may be expended for PS, OE, or construction contractor payments. The Personal Services (PS) category provides funds for state employee salaries and fringe benefits and also supports the costs for consultant work. The Operating Expense (OE) category includes such items as employee expenses, equipment rental and repair, and space rental.

### **1.6.2.3 Funds Management**

The Pavement Management Section is responsible for managing its appropriated funds. The Pavement Management Engineer continually monitors appropriation balances to confirm that the funds are being drawn down as anticipated. Any balance carryover into the next fiscal year is minimized by expending the funds through contracts or by scheduling force-account work.

Newly appropriated funds are added to previous year-end balances (carryover amounts) at the beginning of the State fiscal year on July 1. The effect of any appropriation transfers prescribed by the Budget Adjustment Act or the Appropriations Act is entered at the same time. Entries to start the accounting system at the beginning of the fiscal year are made by the Agency's Budget Officer.

The Section tracks available funds with the Agency's State Transportation Accounting Reporting System (STARS). Expenditures and balances are tracked at both the appropriation level and the project level with STARS. Refer to the STARS manual and to personnel in the Financial Management Section of the Administration Division for information on reports that are available and how they may be used to advantage.

The STARS data is the official accounting information for the Section, although some informal accounting within the unit is necessary for planning and management purposes. A summary of payments to consultants for design services, summarized by consultant and project, is an example of useful management information. An example of this spreadsheet is in the appendix.

On occasion, the Pavement Management Engineer is required to make a projection of the year-end balance in the paving appropriation. This task requires careful attention to the status of payments in progress and the remaining payments anticipated under the contracts or for operations, relative to the current indicated balance in the appropriation. Information is secured from the Construction Section regarding project status and projected expenditures. A five-percent contract overrun factor is anticipated when making projections.

## **1.7 SUPPORT ACTIVITIES**

The Pavement Management Section provides support to the following Agency units and activities.

### **1.7.1 Project Definition Team**

The Pavement Management Engineer serves as a member of the Project Definition Team (PDT). The PDT is made up of managers from the principal Agency units. Its primary role is to review project managers' reports at the end of the project definition phase and any substantial changes in the scope and cost of capital projects, with the goal of assuring engineering excellence.

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### **1.7.2 Pavement Design Committee**

The Pavement Management Engineer serves as a member of the Agency's Pavement Design Committee. The Section supports the research activities of the Committee and advises on the Agency's *Pavement Design Guide* and *Pavement Rehabilitation Guide*.

### **1.7.3 Maintenance**

Pavement Management contracts work for crack sealing, thin overlays, seals, and other preventive maintenance activities.

### **1.7.4 Planning**

Pavement Management provides pavement condition information to the Agency's GIS database and for the Highway Performance Monitoring System (HPMS) report to FHWA. The Section occasionally provides pavement depth and structural capacity information to assist system planning.

### **1.7.5 Roadway Design**

Pavement Management provides recommendations on the appropriate pavement thickness for rehabilitation projects. The Section also suggests possible treatment options to assist in project definition efforts.

### **1.7.6 Construction**

Pavement Management provides advice to resident engineers on paving projects regarding unexpected issues encountered during construction. Issues may include drainage problems, required modifications of guardrail installation standards, changes of project scope, and interpretation of contract plan details. The Section may provide ride quality measurements.

### **1.7.7 Materials and Research**

Pavement Management provides field data to support Materials and Research activities on the Pavement Life Study, the Strategic Highway Research Program (SHRP) site-monitoring activity, and the Agency Research Advisory Committee's study of new or improved products and materials.

### **1.7.8 Traffic Operations**

Pavement Management provides field data on the skid characteristics of pavement surfaces, at locations requested by the Highway Research Data and the Traffic Operations units, by tasking a consultant. Representative projects, with aggregates from the major suppliers, are skid tested when newly laid and after they are subjected to traffic, in an effort to identify polish-susceptible stone.

### **1.7.9 Specifications Committee**

Pavement Management has a member on the Agency's Specifications Committee. The Committee is made up of technical experts from the principal Agency functions. It passes on all changes to the *Standard Specifications for Construction*.

## 1.8 PUBLIC INFORMATION

The annual *Paving Program Report* is a key element of the Section's information efforts. This publication is actively sought by legislators, industry representatives, and Agency management. The report is issued at the beginning of the calendar year and contains information on work completed and conditions existing at that time.

Another information effort is the description of the paving program contained in the Agency's *Capital Program and Project Development Plan*. This document is the subject of interactive TV hearings and is also an annual report to the Legislature.

Communities are notified, and in some cases meetings are held with their managers, during the program formation phase.

The Section regularly provides information to the staff of the Regional Planning Commissions, who in turn inform the local governments.



## Network Management

### 2.1 GENERAL

The Pavement Management Section is responsible for maintaining the paved roadway surfaces on a statewide network, including the 3860-kilometer State highway system, 1030 kilometers of two-lane road and 115 kilometers of ramps on the Interstate system, and 225 kilometers of Class 1 town highway. Sophisticated equipment and techniques assess the health of the network and help develop systematic repairs and maintenance actions.

The Section has broad goals and program measures as guides for managing the network.

#### 2.1.1 Network Goals

Program effectiveness in the Agency is monitored by consistent, observable performance measures. For the paving program, the measures are the overall network condition and the portion of the network in poor condition. See Section 3.2.4.5 for a discussion of condition indexes.

The goals for the paving program are:

- Average condition of all vehicle-miles traveled is greater than 60 on a scale of 0 to 100
- Less than 20 percent of the vehicle-miles traveled are on roadways in poor condition

An annual report of program effectiveness must accompany the paving program budget request.

#### 2.1.2 Level of Improvement

The Pavement Management Section adheres to the concept of the Agency's *Level of Improvement Policy* (LOI). This guide recognizes that the funding available to the Agency is insufficient to fully address all needs. Conceptually, the surfaces of the more important highways are maintained to a higher quality than those of the lower category highways.

To implement this concept, the Section has established acceptable pavement quality standards that differ among the Interstate highways, the National Highway System (NHS) highways, and all other State highways. Thus, before resurfacing is considered, a low-volume collector roadway will have reached a lower ride quality than an Interstate will have reached. The resurfacing treatment provided to the low-volume collector will be a less expensive maintenance-like treatment than that provided



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to an Interstate.

All treatment options, except for chip seals, are available for the Interstate and the NHS. The high-order treatments, such as recycling, reclaiming, structural overlays, and mill-and-fill, are substantially higher in cost. They are not available for the lower classification roadways under the LOI guidelines. Refer to Figure 3-3, on Page 3-6.

Exceptions to the treatments available under the LOI may be approved by the Pavement Management Engineer on a case-by-case basis. For instance, mill-and-fill may be necessary on a curbed collector highway, and cold-recycled-and-overlay treatment may be appropriate on a well-built segment of rural arterial.

### **2.1.3 Shoulder Paving**

It is a statutory requirement to provide paved shoulders for bicycling on major State highways. (See Title 19 Section 2310, Vermont Statutes Annotated, for the full text.) A paved shoulder also aids in providing a safe roadway. During resurfacing, pave the shoulders on major routes where feasible. Resurfacing of existing paved shoulders is done, if warranted, during resurfacing projects.

### **2.1.4 Highway Safety**

The Agency's "Interim Policy on Resurfacing," filed with the FHWA, requires the Agency to provide for improving safety in conjunction with federal-aid resurfacing projects. The policy pertains to highways other than those on the Interstate System. It provides for the following:

- All locations with an accident actual-rate-to-critical-rate ratio of greater than 2.0 are examined. If feasible, within the existing rights-of-way, project designs will improve safety at those locations.
- Existing guardrail that is not of current standard may be replaced in its existing location. Install new guardrail at locations if no guardrail is present and if there is an obvious hazard, such as deep water, to a motorist who might go off the highway.
- Existing throat-type drop inlets may be replaced with grated inlets.
- Traffic signs and roadway markings may be upgraded to current standards.

A copy of the policy is in the appendix.

Projects on the Interstate highways are subject to more extensive safety improvement requirements. The policy on this topic is in the *VAOT 3R Policy*.

To vary from either policy requires a design exception.

### **2.1.5 Preventive Maintenance**

It is desirable to intervene early in the life cycle and to slow the rate at which pavement deteriorates. The goal is to apply low-cost treatments to those pavements that have good subgrade support and adequate subbase, timely enough to defer more expensive treatments. Crack-filling, thin overlays, chip seals, fog seals, slurry seals, and microsurfacing are appropriate preventive maintenance treatments.

## 2.2 NETWORK CONDITION

Accurate knowledge of the condition of the highway network is essential to allow informed decisions on practices and policies for the roadway surfaces. Condition assessment activity serves a number of purposes. The most obvious purpose is to track the system's condition. Condition data also is the basis for selecting the location and the scope for work to be scheduled, supports research efforts, and aids in the development of construction specifications.

### 2.2.1 Construction Quality

The Construction Section's efforts to develop an "end-result" specification for ride quality on new construction and resurfacing is aided by measuring surface roughness. Roughness is measured on projects selected by Construction, both prior to and after placing each layer of pavement. Minimum acceptable values of roughness are established from the data. The intent is to have the construction specifications contain acceptable roughness values for Interstate work and for State highway work.

This activity is part of the Agency's QC/QA emphasis, toward the goal of improving the quality and effectiveness of Agency programs.

### 2.2.2 Research

Ride quality surveys aid and supplement several Agency research efforts.

One of the efforts is the Materials and Research Section's Pavement Life Study. The study monitors the performance of surface types at over 70 locations throughout the State. At these locations, condition data is periodically recorded on 30-meter roadway sections. Ride quality and falling weight deflectometer (FWD) values are measured on each test section. The intent of the study is to determine the life expectancy of various combinations of materials. The study also examines the relationship between the development of roughness and the equivalent single-axle loading (ESALs) actually experienced.

Another Materials and Research effort is to verify the effectiveness of crack-filling on bituminous pavement. In this study, the cracks in one half of selected roadways are filled, while the other side is left untreated. Ride quality on both sides of the roadway is measured periodically.

The Pavement Design Committee's research activity is supported with FWD readings on the subgrade and on each layer of subbase material to verify that expected layer coefficients are being attained. This activity applies to selected new construction projects each year.

A contractor measures the friction characteristics of selected roadway surfaces, under an ongoing Pavement Skid Resistance Study. Selecting the location for the surveys is done in conjunction with the Agency's Traffic Operations unit. The contractor publishes a *Skid Testing Report*.

Calibration sites are prepared for the Section's ride-quality equipment, as well as the contractor's, by use of the "dipstick" (profilometer). The sites are approximately 300 meters long, at strategic locations throughout the State. The sites have varying degrees of roughness. Detailed information is determined on the ride quality in both wheel tracks. Sites are surveyed each year.

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## 2.3 LOCATION REFERENCING

The Pavement Management Section uses the route–town–mile-marker system as reference, except that freeway-type highways are measured from end to end of the routes. The route logs produced by the Agency’s Mapping Section are the basic documentation and reference. Project locations are defined with this system.

In the general location system, each route has a zero measurement at the town (boundary) line. Distance along the route is measured along the centerline, proceeding south to north or west to east. At the next town line, the measurement is reset to zero.

Any change in route alignment obviously creates a shift in data reference for those roadway segments located beyond the change. Confusion occurs if routes merge, becoming coincident on the same roadway, and then diverge.

To avoid reference problems and to allow adjustment of data locations, the reference locations of bridges, major highway intersections, and railroad crossings are included in the pavement management database. Because bridge locations are identified during roadway condition survey runs, they are available for location adjustments.

Freeway-type highways are referenced to base lines, off which markers are placed on the right shoulder of each lane, increasing south to north or west to east. These markers, which are at nominal one-mile (1.6-kilometer) intervals, are the location references. The locations of bridges on each lane are in the pavement management database and also provide location references.

## 2.4 NETWORK ANALYSIS

Pavement Management employs sophisticated analysis techniques to select the appropriate treatment type and timing. Extensive computerized databases contain detailed records collected over several years. The Section uses specialized computer software to analyze the data.

A system administrator operates and manages the software system. The administrator is responsible for loading data, distributing data to others, modifying the models, preparing reports, etc.

The description of the software system in this manual is only an overview. For details on the system and its features, refer to the publication *Development of VAOT’s PMS* and its appendix, by Deighton Associates, July 1995.

### 2.4.1 Computer Software

The pavement management software was acquired in 1995 from Deighton Associates, Bowmanville, Ontario. It consists of three parts:

- A *relational database* containing detailed information on surface condition, pavement type, high accident locations, etc., extending over several years. The software allows manipulation of the raw information so that it is suitable for analysis and reports. The software is referred to as “dROAD.”
- An *analysis segment* that uses the relational database information on which to base a sophisticated analysis and project selection procedure. The program has considerable versatility stemming from its editable analysis parameters, performance curves, and indexes. The software is referred to as

“dTIMS.”

- A *mapping segment* that displays information from the dROAD segment. It provides the capability to query and edit the database by selecting a map location on the screen. The software is referred to as “dMAP.”

The following is a generalized description of the activities associated with and the functions of the software. The software manuals and training videos are available to provide detail.

## 2.4.2 Database

### 2.4.2.1 Content

The pavement management database contains a great deal more information than surface condition data and its location references. The initial database had 24 perspectives, or views, of the highway system. Each perspective contains data that is critical to understanding the roadway network and doing the analysis necessary for proper management of the pavements on the over 500 roadway sections in the network. The database perspectives include, but are not limited to, the following.

- Town limits (political boundary) location on each route
- State and federal classification
- Gaps and overlaps on each route (45 locations)
- National Highway System routes
- Traffic volumes (historical record) and ESALs, including highway functional class
- Construction or rehabilitation history (year, treatment type, project number)
- Pavement type
- Width of traveled way and shoulders
- Research areas (year, treatment, and project number)
- Low skid value areas (skid number less than 40)
- Bridge locations
- Surface condition data
- Level of improvement category
- Open-graded friction course locations and data
- Railroad grade crossings (locations, DOT number, type of protection, number of tracks, railroad operator, and railroad milepost)
- High accident locations (HALs)
- Core sample locations, including depth of pavement found
- FWD test locations, including year tested

- Project locations where work is committed, including project number, estimated construction year, current status, and project description

- Paving history, including treatment type, years resurfaced, and project numbers

The dROADS software is able to integrate all of the information in the various perspectives, along with the roadway condition data, because of its dynamic segmentation capabilities. These capabilities allow transfer of data between segments and reporting of data according to any set of segments. For instance, point data, such as a HAL, can be related to section data, such as low skid-value.

#### **2.4.2.2 Updating**

The extensive variety of data, much of which is from other Agency units, requires active updating. Each year provides new and updated information, work completed, and new projects identified. The system administrator is responsible for soliciting data and searching published information. Information sources include:

- Construction projects completed—annual report by the Construction Section and the record plans for these projects
- Maintenance leveling accomplishment reports—annual reports solicited from the Maintenance Section's maintenance districts or secured from its maintenance management system (MATS)
- Agency Capital Program—annual report approved by the General Assembly (establishes projects committed for the future)
- Preconstruction Project Management System (PPMS)—continuously available information source on projects in development phase
- Railroad Crossing Inventory, maintained by the Rail, Air and Public Transit (RAPT) Division
- Traffic data and high accident location analysis—annual reports issued by the Highway Research Data unit

New automated roadway condition data is checked when received, before entering into the database, to ensure that location references coincide with those used for previous data. Spot checks at randomly selected locations on the roadways verify location and relative accuracy of the automated data.

#### **2.4.2.3 Network Analysis**

Network analysis leading to a program of projects occurs in four steps:

- Define analysis sets and budget amounts
- Generate strategies
- Perform optimization
- Develop program

Program development is discussed in more detail in Chapter Three.

Once the program of projects is established and approved, it is entered in the dROADS database as a set of committed projects.

Network analysis for strategic purposes focuses on the state of the network and its components in the past, present, and future.

## 2.5 TREND ANALYSIS

A very important function of network analysis is to observe and predict trends in network condition. Policy makers are interested in the effect past spending levels had on the health of the network and specific components of the highway network. For example, the current condition distribution on the Class 1 town highways is of interest. Also, the policy maker wants to know the level of funding that is sufficient over time to keep the network or a component at a given condition. Policy makers also want to know the effects of different budget levels.

The Program Development Engineer and the Pavement Management Engineer mutually decide on the effort to be made on tracking and presenting trend information. The needs of policy makers change over time, and the Pavement Management Engineer is aware of any change in interests.

The database information can be shown in graphical or tabular form. A partial listing of the graphics available from the dTIMS software includes:

- Condition distribution over time
- Travel distribution over time by condition
- Cost distribution by program over time
- Cost of treatments over time
- Average condition status over time
- Backlog of deficient mileage over time

Additional information may be presented in map form. For example, maps show planned work locations, treatment locations over several years, and locations of roadway segments in various condition levels.

## 2.6 MAPPING

The pavement management software system has a built-in mapping capability. Maps that indicate the distribution of projects, the relative condition of the system, the locations of different types of treatments, the location of committed projects by type or year, etc., are effective communication tools. Any information in the dROADS database can be shown on a map of the State highway system in color or easily understandable symbols.

Maps created in the dMAP segment of the system may be stored electronically for future reference, printed, or interrogated. Once a map is on the computer screen, the user can select one or more roadway sections. The dROADS information for the selected sections can be viewed or edited in real time.

## 2.7 ANNUAL REPORT

The paving program annual report is one of the key products of network analysis. The report contains a summary of work done in the previous year and the work planned for the ensuing year. Network condition is illustrated, along with a history of paving activity in each district. New initiatives and successes are highlighted.

The Pavement Management Engineer may raise issues for consideration by policy makers and make

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suggestions for addressing the issues.

The annual report is published in January of each year. Distribution is to Agency management, the Agency budget office, the transportation committees in the General Assembly, and industry representatives.

## Chapter Three

# Program Development

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### 3.1 GENERAL

The Pavement Management Section has the capability to select projects and plan funding in full coordination with other Agency programs. Using sophisticated techniques to identify project locations and appropriate treatments, program development attempts to provide acceptable pavement surfaces on all roadways at all times.

Projecting surface needs on the roadway network requires information on what has gone on in the past. Knowing what the current pavement conditions are and what is likely to happen to the conditions in the future is key to accurate projections. The volume and type of traffic on the pavement are very important considerations.

Due to the time involved for project development, it is necessary that paving work be planned well in advance. It is essential to project both surface needs and resource requirements in a series of annual programs extending at least four years into the future.

Programs are annualized lists of projects and activities, constrained by funding and season, that are intended to be sufficiently appropriate and timely to meet the goals of the Pavement Management Section.

### 3.2 PROGRAM DEVELOPMENT

#### 3.2.1 General

Program delivery in the Pavement Management Section follows a systematic process. The principal steps in the process are:

1. Information gathering
  - Pavement condition data
  - Budget
  - External influences
  - Physical conditions or constraints
  - LOI guidelines



2. Network analysis and optimization
3. Conceptual project list (including location and treatment)
4. Field verification
  - Appropriate treatment
  - Appropriate limits
  - Constraints
5. Preliminary project list distributed for comment
  - Management suggestions
  - DTA review
  - RPC/MPO involvement
  - Other program managers review
6. Intermediate project list
7. Field investigation and testing
8. Final project list with recommendations
9. Project design
10. Project construction

The program development process is described in more detail in a following section.

Seasonal limitations on investigation and paving work and the constraints of the budgeting and programming process dictate that program development actions occur in sequence and according to a well-defined series of milestones.

There are few management control and reporting mechanisms during the predesign phase. The data collection unit of Pavement Management maintains a spreadsheet record of testing and investigation work completed. An example of this record is in the appendix.

The Agency's Preconstruction Project Management System (PPMS) provides basic project data and the status of development once the project design work has begun.

The Program Development Engineer inputs preliminary cost data into PPMS after the project name and number are assigned and the project is activated in PPMS by the Agency's Programming Engineer. The Pavement Design Engineer inputs status data into PPMS as progress occurs during the design phase. Refer to the *PPMS Users Manual* and *Programming Manual* for more detail on required input and the reports that are available from the system.

### 3.2.2 Program Development Goals

The Program Development Engineer develops a continuing program while keeping in mind some general goals and factors. The goals include:

- Program sufficient work to use funding anticipated to be available each year.
- Balance the use of federal and State funds to minimize State fund requirements.

- Adhere to the LOI treatments related to the use and classification of the roadway.
- Maximize user benefits and minimize user impacts during construction.
- Strive for a uniform system condition but recognize the importance of equitable geographic distribution of projects.

The factors include:

- The start and completion of design should be consistent with the funding anticipated to be available for the fiscal year in which construction is scheduled. In general, design work needs to be completed in the early winter. Advertising for bids needs to be completed by late winter for work funded in the fiscal year starting on the next July 1.
- Only those projects included in the State Transportation Improvement Program (STIP) may advance to construction.
- Most of the field investigation work that supports program development can be conducted only during the months of May through October.

### 3.2.3 Program Development Process

The process for developing paving projects involves numerous areas of coordination and a considerable amount of decision making.

The time line shown in Figure 3-1, on the next page, defines the principal milestones and sequential actions for program development.

The process begins with information gathering and an analysis of the network condition and leads to the production of a conceptual project list by the pavement management software. The list is refined by considering other factors. The approved project is funded, and design begins after the treatment selection process is completed.

Figure 3-2, on Page 3-5, illustrates the program development process, which is described in the following sections.

### 3.2.4 Information Gathering

#### 3.2.4.1 LOI Guidelines

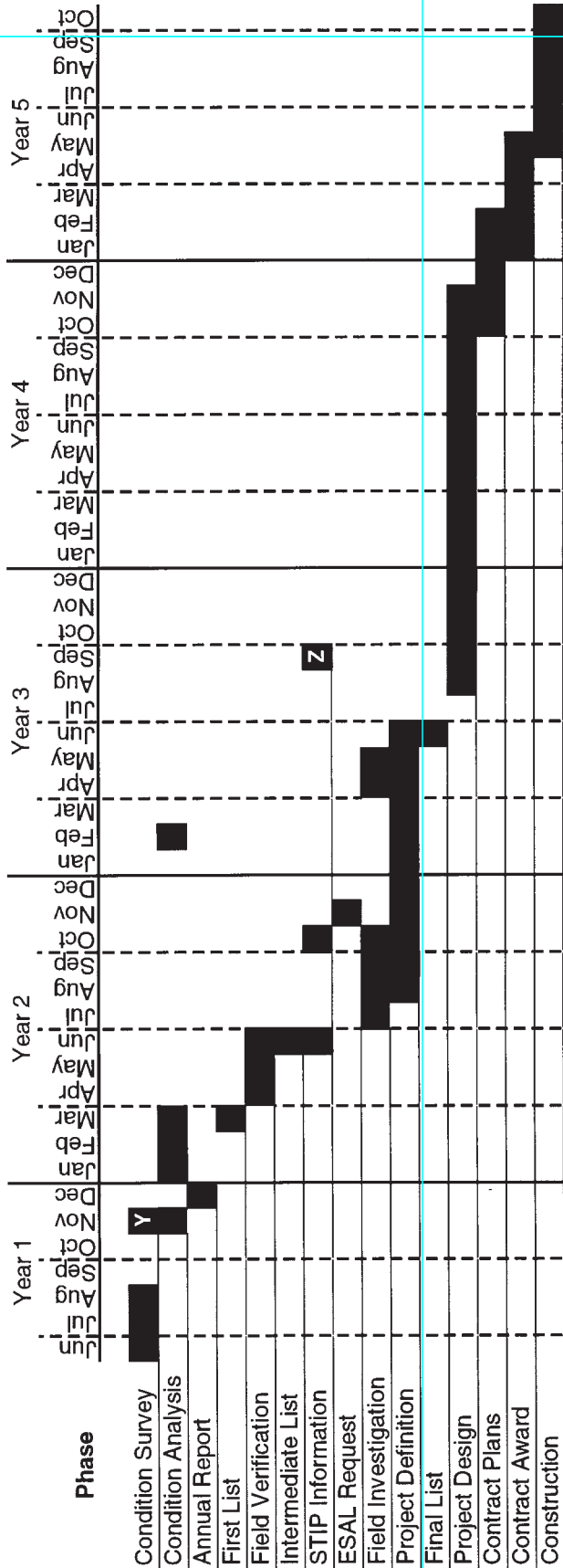
The Agency's *Level of Improvement Policy* (LOI) establishes a philosophy for limiting the scope of work on a specific highway infrastructure to an investment that is in keeping with the functional classification of the highway and the amount of traffic that is anticipated. The Pavement Management Section has refined the policy into types of treatment for certain highway functional class and traffic volume combinations. Applicable treatments, in the context of the LOI policy, are shown in Figure 3-3, on Page 3-6. The usual treatment options with their attributes and limitations are listed in the appendix.

Several alternatives will likely be apparent. The process for selecting the treatment from among those allowed under the LOI guideline is discussed in Section 3.6.3.

Certain elements of information are needed to apply the LOI guidelines in selecting treatment options for any segment of roadway. The information and sources are as follows.

Figure 3-1

**Program Development Time Line**



Y—survey data received  
 Z—revision to STIP

Figure 3-2

**Program Development Process**

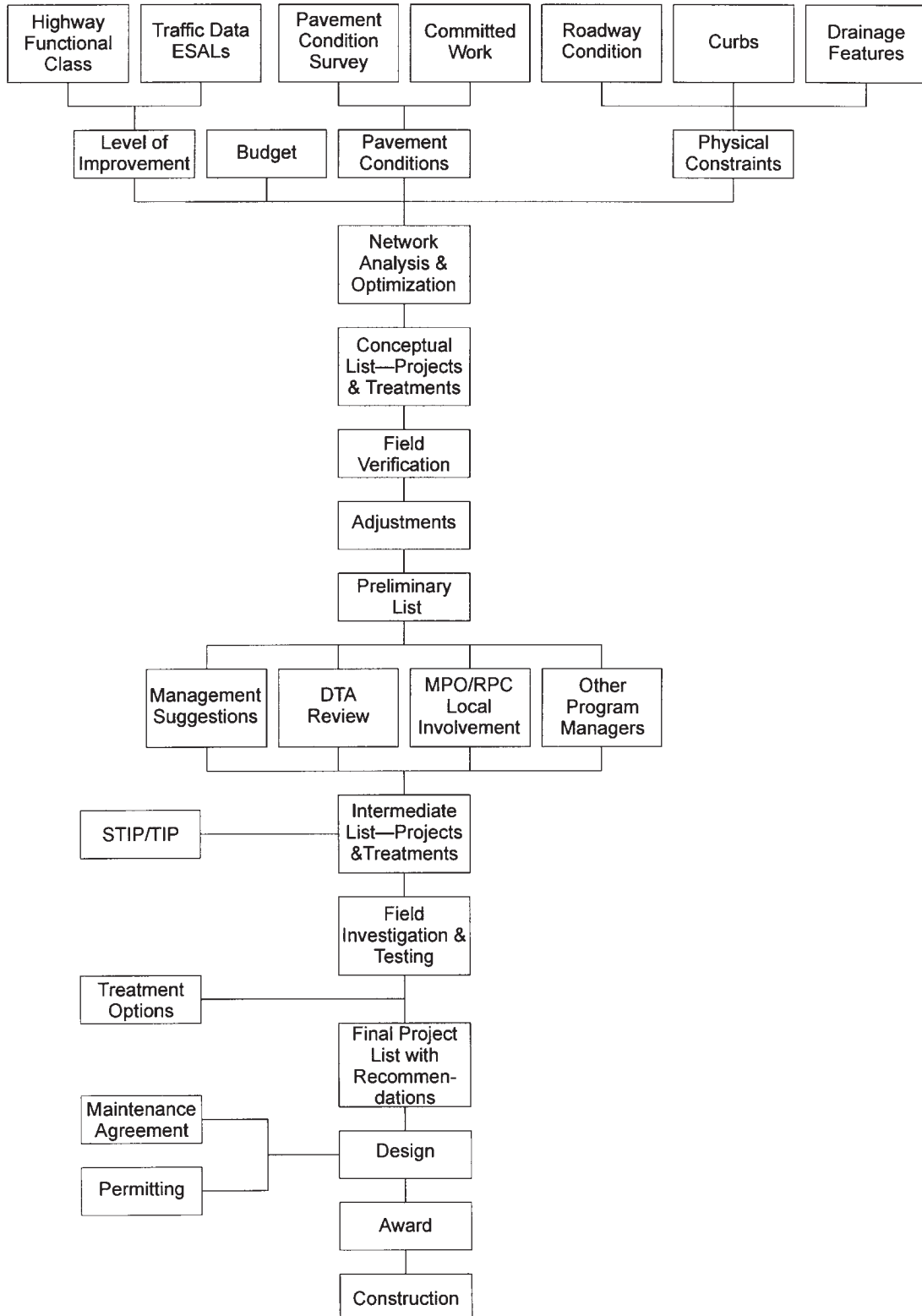


Figure 3-3

**Level of Improvement Treatments**

Highway Functional Class	AADT	ESAL	Appropriate Level of Pavement Treatment		
Interstate			High		
Other Principal Arterial			High		
Minor Arterial—Urban	> 5000		High		
	< 5000	> 1.5mil	High		
	< 5000	< 1.5mil	Intermediate		
Minor Arterial—Rural	> 2500		High		
	< 2500	> 0.8mil	High		
	< 2500	< 0.8mil	Intermediate		
Major Collector	> 2500		Intermediate		
	< 2500	> 0.5mil	Intermediate		
	< 2500	< 0.5mil	Maintenance		
Urban Collector	> 3000	> 1.5mil	Intermediate		
	> 3000	< 1.5mil	Maintenance		
	< 3000	< 1.5mil	Maintenance		
<b>Available Treatments</b>					
<b>High</b>	<b>Intermediate</b>			<b>Maintenance</b>	
Fracture & Seal	Level & Overlay			Thin Overlay	
Cold Recycle	Thin Overlay			Spot Level	
Hot Recycle	Spot Level			Chip Seal	
Reclaim	Slurry Seal			Slurry Seal	
Mill & Fill	Microsurface			Microsurface	
Structural Overlay	Crack Fill			Crack Fill	
Level & Overlay					
Thin Overlay					
Spot Level					
Slurry Seal					
Microsurface					
Crack Fill					

- *Functional Class.* The functional class assigned to each segment of highway is indicated on the “Highway Functional Classification Map” published by the Agency’s Policy and Planning Division. This information is maintained in the pavement management computer database.

- *Traffic Data.* The volume of traffic for analysis and design purposes is maintained in the pavement management computer database. Updated data is obtained from the Highway Research Data Section. The estimated ESALs may be obtained from the same source.

For Interstate and NHS projects, a *design year* estimate of AADT and ESALs must be requested from the Highway Research Data Section.

### 3.2.4.2 Pavement Conditions

#### 3.2.4.2.1 Field Surveys

Contractors are employed to assess and record surface conditions with automated equipment. The equipment measures and records ride quality, rutting, cracking, and the extent of patching.

Automated surveys are made on the Interstate Highway System (both directions, in the driving lanes only) in the odd-numbered years.

The State highways and Class 1 town highways are surveyed in the even-numbered years. Surveys are made only on the lanes in a northerly or easterly direction of travel.

Surface condition surveys are conducted only in the summer months after all effects of frost action are past.

Unit personnel make “windshield surveys” and on-road measurements to supplement and verify the data obtained by mechanical or automated means.

#### 3.2.4.2.2 Condition Survey Practice

Ride quality (roughness) is measured continuously, then aggregated into 161-meter segments and expressed according to International Roughness Index (IRI) standards in m/km.

Rutting, cracking, and patching data is accumulated in the same 161-meter segments. Data is maintained on over 32 000 segments on the Interstates, the Class 1 town highways, and the State highways combined.

The *Pavement Distress Manual*, published by the Strategic Highway Research Program (SHRP), provides an interpretive aid and reference standard. The *Data Collection Protocols* established by FHWA are a national standard and guide for condition assessment. The protocols use roughness, rut depth and cracking as standard condition parameters. The parameters are classified according to severity and extent in establishing condition ratings.

For purposes of analysis, the Pavement Management Section classifies several common types of pavement distress into “low,” “medium,” “high,” and “extreme” categories. The types of distresses considered appropriate for analysis purposes are cracking, rutting, and roughness.

- Cracking is measured in terms of severity and extent. The *severity* of cracking is classified rela-

tive to crack type, width, and patterns according to the following figure.

Deficiency	Low	Medium	High
Transverse Cracking	< 5 mm width	> 6 mm width & < 6 mm depressions	> 6 mm width & > 6 mm depressions
Fatigue Cracking	Fine parallel hairline cracks	Alligator pattern clearly developed	Alligator pattern clearly developed with spalling and distortion
Patching	Little or no defects with smooth ride	Clear signs of cracking and notable roughness	Heavy cracking or other distress with distinct roughness

- The *extent* of cracking is classified relative to spacing and the percentage of wheel path containing cracks according to the following figure.

Deficiency	Low	Moderate	High	Extreme
Transverse Cracking	> 15 m spacing	> 8 m & < 15 m spacing	< 8 m spacing	N/A
Fatigue Cracking	1% to 9% of wheel path	10% to 24% of wheel path	25% to 49% of wheel path	> 50% of wheel path
Patching	1% to 9% of wheel path	10% to 24% of wheel path	25% to 49% of wheel path	> 50% of wheel path

- Rutting is classified in terms of rut depth, and roughness is classified in terms of the IRI measurements, according to the following figure.

Deficiency	Low	Moderate	High	Extreme
Rutting	< 3 mm	3–6 mm	6–13 mm	13–19 mm
Roughness	0–2 m/km	2–2.5 m/km	2.5–3 m/km	> 3 m/km

### 3.2.4.2.3 Supplementary Condition Assessment Activities

Locked-wheel friction measurements are made on selected segments.

### 3.2.4.2.4 Supplementary Information

The video logs produced by the Policy and Planning Division are a source of information and may be an aid in interpreting the automated condition data without going to the site.

### 3.2.4.2.5 Committed Work

Committed work refers to roadway improvements or resurfacing projects that are scheduled and are in the development and delivery process. These projects are indicated in the Capital Program and the STIP.

### 3.2.4.3 Budget

An estimate of funds expected to be available in the program year is available from the Pavement Management Engineer. This estimate is based on projections provided by the Agency’s Budget Officer. The funds remaining after allocations to design and planning activities are used to plan the program of projects for the program year.

#### 3.2.4.4 Physical Constraints

In many instances, the physical conditions and constraints on the roadway either dictate or limit the choice of treatments. It is important to catalog these conditions and consider them when analyzing alternatives and making treatment selections. Some examples are below.

- The roadway cross-section may be so distorted that a seal is not acceptable.
- Curbing may require a mill-and-fill treatment to obtain or maintain an appropriate reveal.
- Portland cement concrete underlying asphalt concrete may limit mill-and-fill or recycling.
- An open-graded friction course requires mill-and-fill.
- Rutting may indicate the presence of either unstable pavement or an insufficient subbase.
- Shoving or washboarding may require mill-and-fill.
- Cracking type and severity may indicate insufficient pavement structure or some other contributing condition.
- Drainage or structural needs may be indicated by deformation of the roadbed.

#### 3.2.4.5 Performance Indexes

Condition data is converted to numeric performance indexes and descriptive terms using the process described in Chapter Six of *Development of VAOT's PMS*, by Deighton Associates. Cracking, rutting, and roughness observations are given an index value ranging from 0 to 100, with 100 indicating the best condition, based on the observed severity and extent of the particular distress in each segment. A composite condition rating is derived from the distress indexes by developing the mean of the indexes for each segment and then adjusting the mean by deducting the standard deviation for the mean multiplied by a factor of 1.25 to reduce the effect of extreme values. The descriptive terms and their relation to the numeric values are: poor = 0 to 40, acceptable = 41 to 65, fair = 66 to 80, and good = 81 to 100.

### 3.3 NETWORK ANALYSIS

#### 3.3.1 General

Analysis results in the identification of roadway sections on which it would be appropriate to provide particular treatments on future dates. The computer system administrator is responsible for setting up the analysis parameters and current cost data, available treatment types, and trigger limits. Filters, performance indexes, performance curves, budget categories, treatments, and treatment triggers are all input parameters for the analysis by dTIMS.

Filters isolate a particular category of analysis sections. For example, Class 1 town highways may be analyzed separately from the State highways on the same route.

Performance indexes are the condition data (roughness, rutting, cracking, and patching) collected on each section by the field data collection and extracted from the dROAD database for analysis.

Performance curves predict performance of each pavement type with respect to age, ESALs, or AADT. These are updated periodically, based on judgment, using information provided by the Pave-



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ment Life Study and by a regression analysis of pavement condition data.

Treatment triggers are the threshold condition values used in analysis to indicate if a particular treatment is appropriate. Triggers for fatigue cracking, transverse cracking, rut depth, and roughness are established in dTIMS for each of the various treatments.

### 3.3.2 Analysis Sections

Analysis sections, or segments of the highway network, are set up using an automatic sectioning routine in the dROADS database software. The sections are alike to the extent that they have consistent pavement type, condition, highway class, and number of lanes. Section limits always occur at the beginning and end of a Class 1 town highway.

The four pavement types used by the Pavement Management Section are:

- *Thick* (THK), such as an Interstate typical or recent State highway reconstruction—typically 155 to 200 mm of asphalt concrete (AC) over 450 mm of crushed stone subbase with a sand underlayer
- *ACP on PCCP* (AONC)—asphalt concrete overlay on portland cement concrete pavement
- *Thin on Strong* (TONS)—typically 50 to 125 mm of asphalt concrete (AC) over greater than 450 mm of crushed stone or crushed gravel subbase
- *Thin on Weak* (TONW)—typically 25 to 125 mm of asphalt concrete (AC) over poor quality granular materials or no granular subbase

All roadways in the dROADS database are in one of the four pavement types.

The condition factors (fatigue crack index, transverse crack index, rutting index, roughness index) are within a 20-point spread within each section on the State highways and Class 1 town highways. On the Interstates the spread is 15 points. The variations or spreads are adjustable for automatic sectioning by dROADS.

No section is less than 1.6 kilometers or greater than 16 kilometers long on State highways or 32 kilometers long on Interstates. Section length parameters are adjustable for automatic sectioning by dROADS.

Committed projects in the Capital Program and the paving program are discrete sections.

### 3.3.3 Analysis Sets

Analysis sets are the sections of the highway network selected by use of the filters and analyzed using various budget amounts. For example, an analysis set may be Interstate highways with \$4, \$6, \$8 and \$10 million per year budgets.

### 3.3.4 Generating Strategies

A strategy is one or more treatments in a time frame. For instance, a strategy may be a seal in year three and an overlay in year eight of an analysis period. A 10-year analysis period is customary. Budget categories, budget amounts for each category, and the analysis sets are defined—a certain amount of program-year funds budgeted on the Class 1 roadways, for example.

The software first predicts the future condition for each network section if nothing is done except restorative maintenance. The predicted condition in each year is checked against the treatment triggers. If it falls within the trigger zone, a treatment strategy is established for the section.

The condition prediction is reset, assuming the treatment occurs, and that treatment's performance curve is used to again predict the future condition. If the future condition falls within a trigger zone, it suggests another treatment at that time. The process is repeated until reaching the end of the analysis period. A full array of all possible strategies is developed for each section.

If future roadway activity has already been identified and committed in a program (paving or capital), the system administrator enters the planned treatment. The software restricts the options to the committed treatment in the committed year. The analysis then moves on to the next segment.

An economic analysis selects the best strategy for each section. Life-cycle costs and benefits are the economic factors. Life-cycle costs are calculated over the analysis period to include the cost of the treatments in the year they are applied. The cost stream is converted to present value, using a four-percent discount rate. Maintenance costs may be considered, if desired. Benefits are estimated using an area-under-the-curve approach.

Two other approaches to cost-benefit are available: net present value and vehicle operating-cost savings.

The present value of the benefits divided by the present value of the costs—the benefit-cost ratio—is computed for each strategy. The software uses the benefit-cost ratio to present a prioritized list of strategies for each section.

### 3.3.5 Performing Optimization

An optimization technique is built into the dTIMS software that compares the various strategies in terms of their benefits and costs, based on an incremental benefit-cost analysis. The strategies with the higher benefit-to-cost ratios—those on the “efficiency frontier”—are considered workable. The alternative with the most benefits for the dollar invested is the “best” strategy. Its cost is deducted from the available budget. If the budget is insufficient, then a less costly (perhaps even do-nothing) strategy is adopted.

For further details on network analysis refer to the dTIMS *Technical Guide*.

## 3.4 PROGRAM OF PROJECTS

### 3.4.1 General

The collection of “best” strategies is the first-cut (conceptual) program of projects. The Program Development Engineer modifies the first-cut program if necessary to alleviate scheduling problems. Combining adjacent sections into a viable contract length may override a theoretical program of treatments.

Projects on Class 1 town highways typically are the full length of significant street segments. Projects on State highways have no arbitrary minimum length but preferably are at least five kilometers long.

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### 3.4.2 Conceptual Project List

The conceptual project list is generated at least three years in advance of the time that paving takes place. For example, FY 1999 State funds and FFY 1998 federal funds support paving work to be done in the summer of 1998. The project list for this work originates in the spring of 1995, based on condition information secured the previous summer.

Projects that were “bumped” from a previous year’s program are included in the list by indicating them to be “committed” projects in dTIMS.

The dTIMS software produces the list based on funding at the level estimated to be available in the program year.

The conceptual project list contains the following information for each project:

- Name of the town in which the project is located
- Route on which the project is located
- Limits of work (beginning and end), expressed by location reference
- Treatment indicated as the highest benefit-cost within the available budget
- Cost estimate for the project (including engineering) as produced by dTIMS

### 3.4.3 Field Review and Verification

Field reviews should be performed on each project in the conceptual project list. The DTAs may join the field review or simply state their concerns, such as excessive potholing being experienced on a segment that was not selected for resurfacing. Conduct the field review as follows:

- Review the beginning and ending locations to avoid leaving short lengths of poor pavement before reaching a relatively good area.
- Note any short intersecting connector highway approaches, jug handles, etc., for possible inclusion.
- In a joint review with local officials, confirm that there is no planned reconstruction or utility work on Class 1 roadways.
- Review any high accident locations with an actual-rate-to-critical-rate ratio over 2.0 for obvious curative measures that could be included in the scope of the project.
- Note scenic highway considerations.
- Note any localized subbase failure or unstable pavement.

All of the information gathered from comments and by the field review is considered. As a result, the project may be deferred, the termini may be adjusted, different treatments may be selected, or a change in scope may be adopted.

### 3.4.4 Project Cost Estimate

The dTIMS software computes a preliminary project cost based on the roadway area or the length of project, depending on the factor specified. If the scope of a project is different from the nominal project as defined by the software, it is necessary to manually compute the difference in cost. For

example, the cost of intersecting road segments (approaches) and any widening of the paved area needs to be added to the amount indicated by dTIMS.

The unit prices for the various treatments, which are in the software, need updating periodically based on experience.

A preliminary project list is the result of this review and analysis.

### **3.5 COMMENTS AND SUGGESTIONS**

Input during program development is actively sought by the Program Development Engineer. The purpose of the input is to have well-coordinated Agency activity and full consideration of the views of those who are affected.

#### **3.5.1 Management Comments**

The Pavement Management Engineer, the directors, and the Secretary of Transportation all receive input on the perceived needs and urgency of improvements to the system as they meet with individuals and groups in the course of their duties. Based on this information, they may occasionally offer suggestions on priority and types of treatment.

#### **3.5.2 Other Comments**

##### **3.5.2.1 Other Program Managers**

The activities in other Agency programs have considerable impact on the paving program. The preliminary project list is circulated to all Agency program managers who are invited to comment. It is imperative to avoid resurfacing a segment of roadway and then having it disturbed by another project shortly afterward. Thus, the Section maintains open communication with other Agency sections, particularly the roadway and bridge program managers, to be aware of their programmed work.

The Agency's 5-Year Capital Program and the Statewide Transportation Improvement Program (STIP) provide scheduling information on planned projects. The Agency's Preconstruction Project Management System (PPMS) has detailed information in its database on the status of all Agency projects.

Field review and consultation with regional planners and district administrators is an important part of arriving at a program of projects.

##### **3.5.2.2 Maintenance Districts**

The maintenance districts receive annual visits from Program Development. These visits provide feedback on performance of previous projects and information on the district's planned culvert and guardrail work. The DTAs have close insight into the current and future condition of their roadways.

The DTAs receive the preliminary project list directly.

##### **3.5.2.3 RPC/MPO**

The Regional Planning Commissions (RPC) and the Metropolitan Planning Organization (MPO) receive regular visits aimed at hearing their needs and the public's attitudes. During the visit, the

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RPC/MPO are briefed on the Agency's goals, challenges, and opportunities relative to paving. The Program Development Engineer coordinates the visits with the appropriate regional planning coordinator in the Agency's Policy and Planning Division.

The RPCs and the MPO receive the preliminary list from the regional planning coordinators in the Policy and Planning Division. All recipients may submit their concerns and any suggested changes.

#### **3.5.2.4 Local Government**

It is essential to contact the local governmental units so they know when work is proposed on their Class 1 town highways. Paving work must be coordinated with utility work or street reconstruction. Street reconstruction will not likely be in the Agency's database.

#### **3.5.3 Consideration of Comments**

All comments are considered and changes are made in the list as necessary to avoid conflicts or comply with worthy suggestions. The intermediate program list is the result of this review and comment activity.

### **3.6 INTERMEDIATE PROGRAM LIST**

#### **3.6.1 General**

The intermediate list is provided to the Agency's Policy and Planning Division in June of each year for inclusion in the draft STIP. The intermediate list is provided to the Pavement Management Engineer and to the manager of the other Agency programs for information and comment. To assist in arriving at the final list, the intermediate list is circulated to the Agency's executive staff for information and comment.

Each affected community receives a letter advising of the proposed work. An example advisory letter is in the appendix. Those communities responsible for roadways nominated for Class 1 town highway projects are asked to affirm the projects.

#### **3.6.2 Investigation and Study**

The pavement management data collection group makes a field investigation for each project on the intermediate list. The amount of investigation necessary to support a treatment selection is relative to the cost of the treatment options. Physical conditions may remove the need for investigation; for example, the presence of curbing may require mill-and-fill treatment.

For each project the pavement management data collection group submits a report to the Program Development Engineer. The report summarizes the field investigation results and makes a recommendation on the appropriate treatments within the project area.

Those project areas that have good roadbed structure are reviewed for required pavement thickness. Recommendations are based on providing the appropriate pavement depth for the design ESALs. The combination of physical data and information from route logs and as-built plans provides the basis for making an informed treatment recommendation.

Investigation techniques that may be applicable include the following.

- Coring, using nominal 50-mm bits, extends the full depth of the existing pavement. The pavement materials are removed, the pavement thickness is measured, and the hole is backfilled with patch material. Visual examination is the usual mode of study.

Analysis of binder characteristics and aggregate properties may be requested from the Agency's Materials and Research Section, particularly if rutting or shoving is observed. If so, a recommendation is required on whether to leave any unstable material in place and bridge it or to remove the unstable material and replace it. The recommendation is based on information gained from coring.

Both the shoulders and driving areas may be cored to determine the pavement thickness and quality. The frequency of coring is usually one core in the right wheel track of the driving lane at 320-meter intervals. Special coring efforts are made in cases of uncertainty or considerable variation in observed conditions.

- Test pits are dug to observe the stratification and quality of pavement, subbase, and subgrade, if the cause of extreme rutting or shoving is in question.
- Testing with a falling weight deflectometer (FWD) indirectly determines the bearing capacity (composite structural number) of the materials in the roadbed. Precise sensors measure the deflection of the roadway materials in response to the impact of weights dropped from varying heights. The information aids in determining the appropriate total pavement depth.
- The DARWIN overlay design software is used to review the adequacy of the existing pavement structure or, alternatively, to design a new pavement structure. Data needed to support the analysis is provided by the coring and FWD testing. Specific information required is the pavement depth, pavement temperature at mid-depth, and the deflection data from the FWD test.

Using procedures outlined in the AASHTO *Guide for Design of Pavement Structures*, the software estimates the subgrade modulus from the pavement and deflection data, and the existing structural number is derived. The software computes the design structural number using the design ESALs.

The difference between the existing and design structural numbers is an indication of the additional pavement thickness (overlay) required for the expected axle loading.

Refer to the manual provided with this AASHTO software product for details on its functions and capability.

- The ELMOD software from Dynatest Inc. may be used for an alternative overlay design. ELMOD is occasionally used to analyze the compaction in subbase layers during construction.
- The profilometer ("dipstick") is used to gather detailed data on the roughness of the existing pavement. The Dipstick 2000 is manufactured by Face Construction Technologies, Inc. The device precisely measures the difference in elevation between two closely spaced points on the pavement surface. The result is accurate rut depth and deformation information. Refer to the manual provided with the equipment for details on its functions and use.

Sites for calibration of the "Mays meter" (see below) are surveyed with this device. Several sites, on roadways of varying degrees of roughness, are strategically located on the State highway system.

- The "Mays meter" is used to gather data on the roughness of the roadway surface. Before use

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it must be calibrated at one of the 300-m sites established with the “dipstick.” The Mays meter is trailer-mounted and accumulates the number of 2.5-mm disturbances that it encounters while passing over the roadway at three prescribed speeds. Processing this data through a computer program results in (highest, lowest, and average) IRI values for 0.32-km segments.

- Historical data, including date of construction, dates of resurfacing, and the materials used, are obtained from the route logs, the as-built plans, materials data, and construction records. The bituminous materials unit of the Agency’s Materials and Research Section is a good source of information. The DTA, the maintenance supervisors, and the resident engineers are also good sources.

### 3.6.3 Treatment Selection

The engineering aspects of treatment selection are highly refined because of the current capability of high-speed data acquisition and analysis, new data sources, a proliferation of available treatments, maintenance considerations, and coordination with other Agency programs.

The selection process requires consideration of the highway classification, the physical conditions, the LOI arrays of allowed treatments, and the funding available. The analyst follows a process of elimination and optimization, starting with the treatment suggested by dTIMS and shown in the intermediate project list.

Often, the most appropriate treatment for a project becomes apparent after consideration of the available information. For example, a mill-and-fill treatment may be the only option for a Class 1 resurfacing project due to curb reveal, drive entrances, and drainage features. However, the most appropriate treatment is not always so obvious.

It is quite challenging to decide to crack-and-seat a lengthy section of PCC roadway when considering the cost, the disruption to traffic, and the lack of high-quality data on life expectancy for that alternative. Conversely, how a level-and-overlay will perform on a roadway with PCC under it is known, and the analyst is optimizing the benefit by selecting this option.

There are many variables to consider when selecting a treatment. The more information available, the more appropriate the treatment selection will be. Testing the existing roadbed for structural capacity is an example of the information required to make an informed decision.

The process is further complicated if analyzing a section of collector highway that has been re-constructed with a strong subbase. The most cost-effective treatment may be a cold-recycle-and-overlay (CROL), a treatment not consistent with the LOI matrix. The CROL treatment may offer considerably longer service life. To propose such a treatment requires a rudimentary analysis of cost and benefit in terms of long-term network condition. The dTIMS software may aid in this analysis. Concurrence of the Pavement Management Engineer is required to include the additional treatments in the analysis.

Once the active options (project treatments) are identified, the analyst selects a preferred alternative. The treatment does not need to be uniform throughout the length of the project, although exceedingly short segments of different treatments are expensive and poor engineering practice. Budget limitations are a significant consideration in the selection process.

Ideally, the treatment selected should be that which provides the highest benefit-cost ratio. If the funds are insufficient, the next best treatment is considered.

The most cost-effective treatments typically occur early in the life of a pavement. The analyst is faced with a difficult decision when the project and treatment with the highest benefit-cost ratio is selected, and this is a roadway in fair condition that would benefit from an overlay, while a section of roadway in very poor condition is not selected because the condition is so poor that the benefit-cost ratio is less attractive than those for other projects.

The LOI guidelines suggest maintaining all roads to a minimum level of service. There is a balance that takes place when considering the long-term health of the network and issues of safety, cost to the maintenance districts to maintain ride, and inconvenience to the traveling public. These issues are not represented on the “efficiency frontier” but are real considerations for the analyst.

The end result of the analysis is selection of a preferred treatment from the treatment options listed in the appendix. The analyst forwards a report with recommendation to the Program Development Engineer.

### **3.7 FINAL PROJECT LIST**

After consideration of comments on the intermediate list, the information obtained in the field investigation and treatment design activity, the final project list is established. In the final list the project scope and location is firm, and the cost estimate considers all aspects of the work. An example final list is in the appendix.

### **3.8 Program Approval**

The final project list requires the approval of the Pavement Management Engineer. The Engineer ensures that the proposed program of projects meets the objectives of the Section and the Agency and is within the anticipated budget. Once approved, the final list is the basis for including the paving projects in the STIP update and proceeding with formal project definition.

The Agency’s Policy and Planning Division receives the final list in September of each year for inclusion in the STIP update. The update is a plan for the proposed use of federal funds in the federal fiscal year beginning October 1 and the next two federal fiscal years.

The final list may require adjustment to fit the amount of funds allocated during the STIP formulation process. In this process, conducted at executive staff level, changes in letting schedules or preliminary cost estimates for large projects may cause significant shifts in funding between one program and another. Due to its inherent flexibility, the paving program may be substantially affected. Projects may need to be added or eliminated to fit the funding anticipated to be available.

The final list is sent to the Agency’s Programming Engineer to use as reference in establishing the new projects in PPMS. In addition, the Program Development Engineer prepares a form PAR/DB for each project on the list. An example form is included in the appendix.

A letter is sent to each affected city, town, or village advising of the planned project, its scope, and the planned date of construction. An example letter is in the appendix.

Those communities selected for Class 1 town highway projects must sign a formal maintenance agreement that defines the responsibilities of the Agency and the local government during and after construction. Design is not to proceed without the execution of this agreement. An example of the agreement is in the appendix.



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## 3.9 PROJECT DATA FOR DESIGN

### 3.9.1 General

Once the final list is established, the Program Development Engineer forwards design data for each project to the Pavement Design Engineer as soon as the data becomes available. Forward the data immediately for projects requiring no field investigation. Field investigation and project definition activity occur within the time frames shown in Figure 3-1, on Page 3-4.

The designer needs certain information to develop the projects that are on the final list. This information is required before the beginning of any sort of design activity. The Program Development Engineer must define the project by providing definite instructions and the required data to the designer so that the project is designed as it was envisioned during the program development phase.

The information is provided in a folder, which upon transmittal becomes the official “design folder” and indicates that project responsibility has been transferred from the Program Development Unit to the Pavement Design Unit.

Although not necessarily an exhaustive listing, typical information that is provided to the designer is highlighted in the following section.

### 3.9.2 Required Data

The Program Development Engineer provides the following data on each project to the Pavement Design Engineer, who then forwards it to the assigned consultant designer. Much of this information is normally consolidated and shown on the pavement design recommendation. See the example design recommendation in the appendix.

- *Project name*—the towns or cities in which the project is located. Indicate if the project is on Class 1 town highway.
- *Project number*—as assigned by the Agency’s Programming Engineer. It indicates the applicable design standard (IN, NH, or STP).
- *Location*—indicated by color coding on a copy of the route log, with mile/kilometer location. Indicate the resultant project length.
- *Treatment*—with locations, if more than one treatment. Treatment recommendations include the binder type, the mix type, and the performance specification to be used. Treatment recommendations must be initialed by the Pavement Management Engineer and the Program Development Engineer. Typical treatment descriptions are shown on the example of the spreadsheet “Pavement Management Project Information” in the appendix.
- *Traffic data*—AADT, DHV, ESALs for the year of construction and the design year. Rough estimates of ESALs only.
- *High accident locations*—locations only. The designer is expected to research details from the Agency’s traffic database.
- *Bridge locations*. The designer is to contact the Agency’s Structures Engineer for guidance on each indicated location.
- *Railroad crossing locations*. The designer is to contact the RAPT Division for guidance.
- *Core information*—list of information obtained from coring of pavement. It is required only

where MAF or CROL treatments are programmed.

- *DARWIN output*—overlay thickness determination.

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## Chapter Four

# Project Definition

Figure 3-1, on Page 3-4, shows the time at which project definition occurs.

### 4.1 DESIGN GUIDELINES

#### 4.1.1 Design Standards

Designs for projects on the NHS (National Highway System) and Interstate follow the *VAOT 3R Policy*. If the *3R Policy* cannot be met for an NHS project, then the “Interim Policy on Resurfacing”—also called the “2R Policy”—is used as a preventive maintenance policy. The “Interim Policy” is in the appendix.

Designs for projects that are not on the NHS follow the STP design objectives and policy—“STP Paving Projects—Design Objectives” and “Interim Policy on Resurfacing” (or “2R Policy”). Both of these documents are in the appendix.

Pavement Management uses the existing roadway width and geometry to avoid the need of acquiring additional right-of-way. Additional safety measures, such as extending guardrail, may be used to avoid the need for right-of-way acquisition; design exceptions may be sought, etc.

#### 4.1.2 Design Guidelines

Design guidelines are listed below.

- *VAOT 3R Policy*
- “Interim Policy on Resurfacing” (“2R Policy”)—in the appendix
- “STP Paving Projects—Design Objectives”—in the appendix
- *A Policy on Geometric Design of Highways and Streets—1994*, AASHTO (the “Green Book”)
- *Roadside Design Guidelines—Approved 1988*, AASHTO
- “Draft Policy on Shoulder Paving”—in the appendix
- *Manual on Uniform Traffic Control Devices (MUTCD)*
- “Pavement Marking Guidelines”
- “Guidelines for Bridges on STP Projects”—in the appendix

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In addition, the Agency provides:

- *Crosswalk guidelines.*
- *Item estimating guidelines.*
- *Miscellaneous procedural guidance from Contract Administration.*
- *Standard Specifications.* Use the version cited in the project's design folder.
- *General special provisions.* Use the current version.
- *Supplemental specifications.*

Projects use metric dimensioning except for mile markers and the length of the project, which is expressed in both metric and English units.

#### 4.1.3 Design Exceptions

A design exception may be required if designed project features are not in conformance with the 2R or 3R policies, as they are applied. (See Section 4.1.1.)

Design exception requests are submitted with the preliminary plans. An example design exception request is in the appendix. It includes the flowchart for the design exception process.

Design exceptions must be approved by the Pavement Management Engineer, the Director of Construction and Maintenance, and the Secretary of Transportation. In addition, the FHWA must approve design exceptions for Interstate projects.

Approvals are based on the extent of historical, archeological, wetland, and social and economic impacts and on the avoidance of significant increases in scope or cost.

#### 4.2 DESIGN DATA

Before providing the design folder to the consultant (Chapter Three), the project manager confirms or corrects information in the folder and provides some additional information:

- *Pavement Markings.* The project manager extracts marking information for the project area from the pavement marking log provided by Traffic Operations. The project manager confirms crosswalk locations with Traffic Operations.
- *HAL (High Accident Locations).* The project manager confirms the HAL locations in the design folder by comparing them with the information in the current "Yellow Book" (*High Accident Locations*) provided by Highway Traffic Research.
- *Bridge Information.* The project manager collects bridge information from the Structures Section and Maintenance Section, such as planned deck work and the desired scope of the resurfacing project, and forwards it to the consultant.
- *Scenic Highways and Byways.* The project manager verifies whether the project is on a scenic highway or byway by checking the current list provided by the Planning Division. A copy of the list is in the appendix.
- *Utilities.* Pavement Management provides the Utilities Unit with a list of projects after the final program list is developed, as described in Chapter Three. The Utilities Unit reviews the list and provides the information about utility locations and utility company plans and actions to Pavement Management. The project manager verifies that the latest information is in the design folder.

- *Signs and Signals.* The project manager requests Traffic Operations to review its inventories to identify signal loops that will be rendered ineffective by the project, required upgrades for NHS routes, etc., as well as a sign inventory for the project. The project manager forwards the information to the consultant.
- *Railroad Crossings.* The project manager confirms or corrects the information in the design folder by checking with the RAPT Division.
- *Traffic Data/ESALs.* The project manager confirms that the information is in the design folder.

### 4.3 SCOPE DEFINITION

The Section's Pavement Design Engineer is responsible for coordinating the activities involved in scope definition.

#### 4.3.1 Surfacing

The Section's Program Development Engineer develops project design recommendations. The recommendations are summarized on the "Pavement Management Project Information" spreadsheet. Examples of both the recommendation and spreadsheet are in the appendix.

During project definition, the recommendation for the type and depth is confirmed or corrected for field conditions. The Pavement Management Engineer approves all changes.

#### 4.3.2 Shoulders

Shoulder treatment guidance is in the "Draft Policy on Shoulder Paving," included in the appendix.

A project usually includes overlaying existing paved shoulders or paving gravel shoulders. Existing paved shoulders typically receive full-width leveling and a top course. A project may include the removal of 75 to 100 mm of existing material and replacement with subbase or bituminous mix.

Shoulders usually are backed with Aggregate Shoulder. However, topsoil is used for backing in lawn areas, and milled bituminous concrete is used if it is suitable and available.

A minimum of 1200 mm of shoulder for bicycle use is desired. However, do not widen the existing roadbed to obtain additional shoulder width.

#### 4.3.3 Safety Elements

##### 4.3.3.1 Guardrail

On 2R projects, nonstandard guardrail typically is upgraded to galvanized "W" beam if the criteria in "STP Paving Projects—Design Objectives" (in the appendix) are met. Weathering steel can be used in aesthetically sensitive areas. Other rail types may be selected on a case-by-case basis. Guardrail end treatments are selected to meet field conditions.

##### 4.3.3.2 Signs

On 2R projects, only signs associated with pavement markings are replaced on the mainline. On

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NHS projects, all signs are replaced on the mainline. On either type of project, all Stop signs and legal load-limit signs are replaced on roads intersecting the mainline.

#### **4.3.3.3 Signals**

Moderate or major signal work is rarely performed on a Pavement Management project, although some may occasionally be included to treat a HAL. Loop detectors, however, are frequently replaced in kind if disturbed during project construction.

#### **4.3.3.4 Roadside Obstacles**

On 2R projects, new guardrail installations may be placed, and existing installations may be adjusted or extended. See “STP Paving Projects—Design Objectives” in the appendix. NHS projects must provide for adequate clear zones.

#### **4.3.3.5 Intersections**

If intersections are to be reconfigured, Traffic Operations typically provides the guidance. The guidance should be in accordance with the “STP Paving Projects—Design Objectives,” in the appendix.

### **4.3.4 Parking Provisions**

Parking provisions are included in a project if the existing pavement markings will be obliterated during the project’s construction. A city or village may elect to place the markings on Class 1 town highway projects.

Use the MUTCD (*Manual on Uniform Traffic Control Devices*) and State law for layout guidance. A copy of Title 23, Section 1104, is in the appendix. A municipality may supplement the statute with an ordinance, etc.

### **4.3.5 HALs**

For non-NHS projects, the HAL treatment policy is in the “Interim Policy on Resurfacing,” included in the appendix. The consultant must contact Highway Traffic Research, Technical Services Division, for the required accident reports, perform the appropriate analyses, and submit them to the Pavement Management Section for approval. All HALs are treated on an individual basis in consultation with the Pavement Management project manager and in accordance with the example HAL analysis in the appendix.

### **4.3.6 Pavement Marking**

All pavement markings are in accordance with the latest edition of the MUTCD. Centerline (passing zones) information is provided by Traffic Operations, as indicated earlier. See the *VAOT 3R Policy* for lane widths for both NHS and non-NHS roads. Replace existing pavement markings according to current standards. See the “Pavement Marking Guidelines,” which can be obtained from the Pavement Management Section, for markings required during construction. Generally, thermoplastic is used for permanent markings, and paint is used for temporary markings.

### **4.3.7 Drainage**

On 2R projects, drainage improvements typically are limited to rehabilitating drop inlets, improving

pavement crown, cleaning ditches, and other “surface” improvements. More extensive improvements may be made on NHS projects. For details, see the VAOT standard drawings and the *Standard Specifications for Construction*.

#### **4.3.8 Bridges**

Bridge treatments are limited to those recommended by Structures. Typical work is as follows:

- If the deck is overlaid, the project may include cold planing or a simple overlay.
- 3-cable rail is replaced. (Other existing bridge rail may be upgraded on a case-by-case basis.)
- Blunt ends of bridge curb are flared back.
- If bridge railing is upgraded, the associated approach railing is upgraded.
- Joints and joint seals are repaired or replaced if needed.

For 2R projects, see the “Guidelines for Bridges on STP Projects,” in the appendix.

#### **4.3.9 Scenic Quality**

Scenic quality is addressed project by project. Guardrail, shoulders, etc., may be modified if concerns are raised by the affected municipalities or other interested parties.

#### **4.3.10 Americans with Disabilities Act (ADA)**

All projects are required to conform with the ADA. See the ADA and the VAOT standard drawings.

#### **4.3.11 Railroad Crossings**

The RAPT (Rail, Air and Public Transportation) Division, in conjunction with the railroad companies, determines railroad crossing treatments. Options for a crossing run from no treatment to a new prefabricated crossing.

#### **4.3.12 Sewer, Water, and Telephone**

Special provisions for utilities are coordinated and handled by the Utilities Unit. On Class 1 town highway projects, the consultant is required to contact local utility owners for locations of existing surface utilities so that they may be included and identified on the project plans. Contacts are made and preliminary treatments are discussed at the Class 1 predesign meeting.

#### **4.3.13 Design Exceptions**

The consultant must identify the need for design exception requests and compose and submit design exception documents. Design exceptions should cover all variations from established policies and guidelines.

### **4.4 ENVIRONMENTAL PERMITTING**

The Pavement Management Section typically is not directly involved in the environmental permitting process. The documents for requesting a categorical exclusion are prepared by a consultant. The



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documents can vary from a letter of “no effect” to those needed for a full historical and archeological review. An example set of documents is in the appendix. The consultant submits the documents to the Environmental Permitting Chief. If the submission is accepted, it is sent to the FHWA by Permitting.

#### **4.5 SCENIC CONSIDERATIONS**

On all “scenic highway” projects, the project manager must confer with the Regional Planning Commission (RPC) to determine the nature of scenic concerns. Scenic areas may require the placement of weathering-steel box-beam guardrail, special treatment of drainage inlets, special shoulder materials, special signing, etc.

#### **4.6 FINANCE AND MAINTENANCE AGREEMENTS**

A finance and maintenance agreement is an agreement between the Agency and a village or city that sets forth the conditions under which a project is undertaken. A finance and maintenance agreement is needed only for Class 1 town highways. Generally, the agreement covers the responsibilities of the municipality in regard to right-of-way encroachments, utility relocation, maintenance of traffic control devices installed during the project, road maintenance during possible suspension of the project in the winter, etc., in exchange for the completion of the project by the State. The agreement is based in part on Title 19, V.S.A., Section 306a. A copy of a finance and maintenance agreement and Section 306a are in the appendix.

A finance and maintenance agreement is processed as follows:

1. Pavement Management provides Contract Administration with a list of project names, numbers, and limits after the final project list is developed. (See Chapter Three.)
2. Pavement Management requests that Contract Administration prepare a finance and maintenance agreement for a project.
3. Contract Administration composes the agreement and sends it to the Auditor and Assistant Attorneys General for review and to Pavement Management for content review.
4. Contract Administration sends the agreement to the municipality for signature.
5. The agreement is signed and dated by the Secretary of Transportation.

Design may proceed only if the agreement is executed.

#### **4.7 RAILROAD AGREEMENTS**

A railroad agreement is an agreement between the Agency and a railroad company that has a crossing within the project limits. An agreement is required if the construction will foul typical rail operations as determined by the RAPT Division, often in consultation with the affected railroad. The agreement generally covers the type of treatment for the railroad crossing; the responsibilities for the work; and, if the work is performed by the State’s contractor, insurance requirements, provisions for entering the railroad’s right-of-way, permitting, and safety during construction. An example railroad agreement is in the appendix.

A railroad agreement is processed as follows:

1. The Program Development Engineer sends a list of the projects with railroad crossings to the RAPT Division after the final project list is developed. (See Chapter Three.)
2. RAPT contacts the railroad company to determine the type of treatment for the crossing.
3. The railroad company elects either the State or itself to perform the work and relays the decision to the responsible RAPT project manager.
4. Pavement Management provides the project's name, number, EA (expenditure account) number, description, location, and plan sheets, if available, to Contract Administration and requests that Contract Administration compose the agreement.
5. Contract Administration composes the agreement and sends it to the Auditor, Assistant Attorneys General, RAPT, and Pavement Management for review.
6. Contract Administration sends the agreement to the railroad for signature.
7. Contract Administration sends the agreement to the Secretary of Transportation for signature and dating.
8. The agreement becomes part of the contract special provisions for the project.

If the treatment is a surface treatment, the project manager takes the lead for the State. If the treatment consists of safety improvements, the RAPT Division takes the lead for the State.

#### **4.8 UTILITY AGREEMENTS**

Utility agreements are agreements between the State and utility companies or towns as to whether utility adjustment or relocation is needed because of a project, who will perform the adjustment or relocation, and the conditions regarding right-of-way access and use. The agreements are summarized in the project's special provisions. Examples of letters and special provisions are included in the appendix.

For Class 1 projects, utility adjustments are paid for under the contract.

For a State project that affects a town, the Utilities Unit informs the officials of the town that the town may need to adjust its utilities. After the Utilities Unit receives the preliminary plans, it contacts the town and begins writing the utility agreement.

For other utilities on a State project, the Utilities Unit researches preliminary plans to identify the utility companies that are affected and contacts them.

The Utilities Unit writes the special provisions and sends them to Contract Administration.

#### **4.9 COORDINATION REQUIREMENTS**

A letter is sent from Pavement Management to a municipality affected by a State highway project when the final program list is approved. (See Chapter Three.) The letter receives wide distribution: Regional Planning Commission, DTA, Planning's regional planner, program managers, Materials and Research, Construction, etc. An example letter is in the appendix. In addition, predesign meetings

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are held with municipal officials for Class 1 town highway projects. (See Section 4.10.)

The annual program is reviewed with the Construction Section to obtain its advice.

The project manager can promote coordination by:

- Checking with the program managers of structures and roadways to coordinate with the capital programs.
- Checking with the affected DTA to coordinate with the bridge membrane program, guardrail program, etc.
- Checking with the Policy and Planning Division's regional planning coordinator and STIP coordinator.
- Checking with affected MPOs (Metropolitan Planning Organizations) to ensure that the project is on the TIP.

#### **4.10 PREDESIGN MEETINGS**

The Project Design Unit conducts a predesign meeting with all of the consultants engaged in an annual program to provide policies, procedures, example plans, initial assignments, plan distributions, VAOT expectations about timeliness, etc. VAOT Environmental Permitting attends the meeting to provide information about environmental matters. The meeting is informational rather than technical and is not project specific.

The consultant conducts predesign meetings with municipalities included in Class 1 projects, as mentioned in Section 4.09. The meetings are held to discuss the intent and goals of a project and to address initial concerns of the municipal officials.

## Project Plan Development

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### 5.1 CONSULTANT CONTRACTING

Most projects are designed by consultants. Consultants that are designing projects begin at the preliminary estimate stage and continue through field survey and plan preparation. The work includes obtaining environmental clearances (primarily, confirming that there is no impact from the project).

Consultants may also be contracted to review shop drawings. Shop drawing review is limited to the review of bridge-rail fabrication drawings.

#### 5.1.1 Scope of Work

The scope of work for most Pavement Management projects includes resurfacing and minor safety and drainage work. Urban projects typically include sidewalk ramps and often include other work related to urban road features.

#### 5.1.2 Selection

Selecting a consultant for a project consists of the following:

1. The Pavement Management Section evaluates past performance of eligible consultants, along with the geographical areas usually covered by the consultants relative to the project location. Two consultants are invited to offer proposals on Interstate projects. Other projects usually are assigned to a particular consultant.
2. The Section's Pavement Design Engineer requests a design cost estimate and schedule from the selected consultants and provides any available information for a proposal. A request letter is in the appendix.
3. The consultants submit the cost estimates and schedules. The consultants should review the project in the field prior to submitting the material.
4. The Pavement Design Engineer compares the estimate and schedule from each consultant with those that are desired by the Agency and determines whether the two sets of information are sufficiently close to proceed.

5. A consultant is selected to perform the work.
6. The Pavement Design Engineer assigns a project manager.
7. The Section provides a notice to proceed to the consultant, and the consultant begins designing the project. An example notice to proceed is in the appendix.

### 5.1.3 Administration

After the notice to proceed is issued to the consultant, the Pavement Design Engineer updates the financial tracking spreadsheet for design work flow, which is internal to the Pavement Management Section. A example spreadsheet is in the appendix.

The project manager updates the PPMS (Preconstruction Project Management System) at the time design authority is issued to the consultant:

- *Screen 35.* Enter consultant's name.
- *Screen 444.* Enter the design begin date for Activity 180. The begin date is the date on which the notice to proceed is issued to the consultant.

## 5.2 PREPARATION OF PLANS

### 5.2.1 Information Sources

VAOT provides a variety of information for plan preparation if it is required or requested:

- Project folder (Chapters Three and Four)
- Standards
- CADD seed and detail files (from the VAOT computer bulletin board)
- Sample plans
- Utility information on municipal projects

The consultant designer secures all other needed information by research or field survey.

### 5.2.2 Plan Set Makeup

#### 5.2.2.1 General

The purpose of plans is to provide construction engineers and technicians and contractors with sufficient information to complete the desired construction. To ensure consistent interpretation of the plans, each sheet should have a standard format and content, and the sheets should be assembled in the same sequence on all projects. Sheets may be combined to reduce the number of sheets on smaller projects.

This section presents guidelines for plan preparation to ensure that construction plans are clearly and uniformly prepared by designers for correct interpretation during construction. General guidelines are:

- All plan sheets are drawn and read with their major dimension in a horizontal plane. Metric logos are required on all sheets.

- The corner card must be completed on every sheet.
- Quality control of the plans is achieved through the reviews at the various plan stages.

#### **5.2.2.2. Title Sheet**

##### *5.2.2.2.1. General*

A title sheet is required for each project or separate contract. It is the first sheet in each set of plans. Items to be included on the title sheet are:

- Project location sketch
- Project area map
- Project location and description
- Traffic data
- Superpave design data
- Conventional symbols
- Statement indicating the applicable version of the *Standard Specifications for Construction*
- Control block data
- Notes
- Signatures of the approving authority

Follow the format shown for the sample title sheet in the appendix for all single project plans. A title sheet for multiple-project contracts is also in the appendix. It summarizes the applicable single-project title sheets.

##### *5.2.2.2.2. Project Location Sketches*

The project location is indicated by two sketches in the upper right-hand corner of the sheet. One sketch shows the location within the State and county. The other shows the location within the regional highway network. It may be traced or reproduced from a State road map. The regional sketch (vicinity map) includes a north arrow and scale. The regional sketch should be drawn so that the north arrow points to the top of the sheet. Items that should be clearly shown on the vicinity map are town, county, and state lines; major rivers; lakes; cities and villages; and route numbers (including town highways) of all highways abutting or in the immediate vicinity of the project.

##### *5.2.2.2.3. Project Area Map*

The project area map is a general alignment plot of the project at the largest practical size. The map shows the adjacent and connecting highway network, adjacent towns, and north arrow. All roads, rivers, and significant topographic features should be clearly labeled. Arrows should be used to show the direction of flow of all rivers and streams. An arrow, route number, and destination should be shown at the end of the portion of each major road that is shown on the map. Town, county, state, and country lines should be shown.

The following types of construction are labeled as indicated, with lettering parallel to the bottom border and arrows indicating the location of the project. The nomenclature below is for metric stationing. Kilometer markers may be used as applicable or directed.

■ *Project and/or contract limits*

Sta. 25+000.00  
Begin Project STP 9999(1)S

Sta. 26+000.00  
End Project STP 9999(1)S

Adjacent projects or contracts should be indicated with the year built, if pertinent.

■ *Gap within a project not requiring construction effort*

Sta. 72+048.52  
Stop Project

Sta. 72+050.96  
Resume Project

■ *Bridge to be constructed*

Sta. 25+027.42  
Stop Roadway—Begin Bridge

Sta. 25+179.82  
End Bridge—Resume Roadway

■ *Railroad grade crossing to be constructed*

Sta. 72+048.52  
Stop Roadway—Begin Railroad Crossing

Sta. 72+050.96  
End Railroad Crossing—Resume Roadway

All stationing should be tied to the VAOT route logs at the beginning and end of the project and at other fixed points, such as side roads and bridges.

*5.2.2.2.4. Project Location and Description*

The project location and description is centered beneath the preprinted sheet heading.

The location and description of the project should agree with the description submitted by Program Control in programming the project with the FHWA. The project manager provides this information to the designer.

The town, county, and route number should appear on separate lines directly beneath the heading. The lettering size and style should be identical with that used in the heading. The town highway class designation should appear on a separate line after the route number.

In the detailed project location, all distances are given in meters to two decimal places and usually should follow the example below.

“Beginning in Jamaica at a point 5423.48 m north of the Townshend/Jamaica town line at Sta. 5+423.489 (MM 3.370) and extending northerly along Vt. Route 30 for a distance of 14 307.27 m to a point in Winhall at Sta. 3+445.606 (MM 2.141).”

The location should normally be referenced to the southerly or westerly town line for all State highway and Interstate projects. References for town highway projects usually should be to the town line or the westerly or southerly terminus of the town highway.

The project length is shown in kilometers and broken down into roadway, bridges, and railroad crossings, if construction is required. The lengths provided should agree with all stationing and equations provided on the project area map and should read as follows:

Length of Roadway	3763.00 m
Length of Bridges	37.00 m
Length of Railroad Crossings	3.00 m
Length of Project	3803.00 m

The project description should identify the principal construction elements of the project and usually should follow the format of the example below.

“Work to be performed under this project includes cold planing, resurfacing of the existing highway with a shim/leveling course and wearing course, new pavement markings, drainage improvements, safety improvements, and incidental items.”

#### 5.2.2.2.5 Traffic Data

Traffic data is provided by Traffic Research and includes:

- 19\_\_ ADT      Average daily traffic in the year project is open to traffic.
- 20\_\_ ADT      Average daily traffic in design year.
- 20\_\_ DHV      Design hour volume in design year.
- D              Percentage of traffic in predominate direction in the design hour.
- T              Percentage of truck traffic in design hour.
- V              Design speed.
- ESAL          Equivalent single-axle loading.

The design year is normally 10 years beyond the date that the project will be opened to traffic.

#### 5.2.2.2.6 Conventional Symbols

The conventional symbols are preprinted on the title sheet and normally require no modification. Additions to the list may be made as required.

#### 5.2.2.2.7 Control Data Block

The vertical and horizontal datums, if applicable, on which the survey for the project is based are shown in the control data block to the right of the conventional symbol block.

#### 5.2.2.2.8 Notes

General notes for the project are placed to the left of or above the corner card. The current *Standard Specifications* must be referenced in the general notes.

Notes usually must be in metric units. Do not mix metric and English units.

#### 5.2.2.2.9 Signatures

The corner card is filled out with the project name and construction number and the name of the project manager.



The title sheet is signed by the appropriate persons in the corner card only when the contract plans are submitted. On a composite-contract group, only the composite title sheet requires signing. If the project is designed by a consultant, the company logo and the stamp and signature of the responsible P.E. are required on the applicable title sheet.

### 5.2.2.3 Index of Sheets

#### 5.2.2.3.1 Contract Plans

The index of sheets may be placed in the upper left-hand corner of the title sheet if there is room. If not, a separate sheet is required.

All sheets to be included in the plans for the project must be listed in the index, usually in the order given in Figure 5-1, below. Blanks may be inserted to allow for unforeseen additions or to avoid renumbering if sheets are added or deleted.

**Figure 5-1. Index List**

Sequence	Description
1	Title sheet
2	Index sheet
3	Typical sheets, mainline
4	Typical sheets, side lines
5	Pavement details
6	Summary of quantities
7	Item detail and drainage sheet
8	ROW detail sheets
9	Layout sheets
10	Bridge details
11	Traffic signs, signals, and pavement markings
12	Traffic control details
13	Guardrail and other details
14	Utility details

Additional sheets may be added as required when a project increases in complexity.

Sheets are numbered consecutively starting with the title sheet. Blank pages may be inserted to allow for the addition of extra sheets during plans development, without renumbering all of the sheets.

All standard sheets required for the project, including those standards required for bridges and traffic control, are listed at the end. The sheet number, title, and effective date for each standard are shown. Standard sheets are not numbered consecutively with other sheets.

#### 5.2.2.3.2 Standard Sheets

Current effective dates for all standard sheets must be shown in the index. Current effective dates for roadway standard sheets are listed in the appendix.

The use of certain standard sheets may require the inclusion of certain other standard sheets. The designer should be aware of such cross references to ensure that all necessary standard sheets are included. Examples are listed below in Figure 5-2.

**Figure 5-2. Standard Sheet Cross References**

If required	Also required
D-6	D-11 and/or D-16
D-8	D-9, D-10, or D-11
D-13	D-6, D-9, D-10, or D-11
E-45	E-24A
G-1d	G-1
G-7	G-6 or G-6A
G-8	G-6, G-9, and SB-R1-71, Sheets 1 and 2
G-8A	SB-R1-71, Sheets 1 and 2, and G-1 or G-11
G-9	SB-R1-71, Sheets 1 and 2
SB-R4-73	G-1b

#### 5.2.2.4 Typical Section Sheet

The purpose of the typical-section sheet is to show the shapes, dimensions, and materials used in the roadway or roadbed construction. The typical-section sheets should show the typical sections, thickness tolerance notes, general notes, and seeding formulas. See the appendix for an example typical-section sheet.

Typical sections show the types of surfaces, crown, lane widths, shoulder widths, slopes, slope treatments, median widths, edging, curbing, sidewalks, and faces of guardrail locations. For portland cement concrete typicals, show joint, joint-spacing, tie-bar, wire-mesh and load-transfer-dowel details, as appropriate. If possible, previously prepared standard typical sheets should be used in project plans.

- **Header Information.** “Typical Sections” is centered at the top of the sheet. Below it are the following:
  - The type and thickness of surface.
  - The type and thickness of base course.
  - The type and thickness of subbase.
  - The type and thickness of shoulder surface.
  - Any other items pertinent to the roadbed.

As an alternative, the information can be spelled out on the typical drawings.

- **General Notes.** A list of general notes and references for the project must be included on the typical-section sheet. If more than one typical sheet is used on a project, the detailed information is provided on the first typical-section sheet only, with references to it on all other typical-section sheets.

References should be made to the locations of any typical sections appearing elsewhere in the plans.

A corner card in the lower right-hand corner of the sheet identifies the project, contract, and construction stage.

- **Seeding Formulas.** Seeding and fertilizer formulas and rates of application are shown on the typical-section sheet. Topsoil, limestone, and mulch are shown if appropriate. Typically, topsoil 50 mm thick is spread to the subgrade line. Use lawn or rural seeding mixes as appropriate. Show both mixes on projects that require both types of seeding. As with the general notes, if more than

one typical-section sheet is used, the information is provided on only one typical-section sheet.

Other guidance for typical section sheets is below.

- *Roadway Typical*s. Show all of the typicals for the mainline first and then other typicals. Typicals for all driveways and approaches should appear in the project plans. Roadway typical sections must comply with the standard drawings. The use of sections that exceed these must be justified.

Show the number of typical sections needed to define the roadway throughout the project. Each section should show the applicable locations and the widths, thicknesses, and materials as they apply to normal conditions.

Show the number of courses (lifts) and type of mix for each course next to the bituminous concrete pavement item.

- *Ditch Typical*s. Show detailed drawings of the shoulder composition and ditch dimensions or treatments if required for clarification.
- *Sidewalk*s. Follow the standard drawings and AASHTO design standards for typical sections for sidewalks. These standards include ADA ramps. A detail showing pay limits and items should be used when fitting an ADA ramp to an existing sidewalk.
- *Clear Zones*. Clear-zone widths should be specified on all typicals, in fill and cut, except where guardrail is shown. Clear-zone widths should be measured from outside edge of pavement and be based on the criteria discussed in the AASHTO *Roadside Design Guide*. Typically, the information is provided only for projects on the NHS.

#### 5.2.2.5 Quantity Sheets

The purpose of the quantity sheets is to provide summaries of all bid items for the project. Items are listed in numerical order. The item descriptions must exactly match those carried in the VAOT item listing. Quantity sheets include detailed summaries of quantities for major pay items and summaries of the total estimated quantities for the project. An example quantity sheet is the appendix; it shows the proper notations of the details described below.

- *Detailed Summary of Quantities*. This summary is used to show the breakdown of quantities for major items—large quantities or expensive items. Separate quantities should be shown for each lane (if calculated that way), each ramp, each side line, each rest area, and any special uses. The rounding and total quantity should also be shown.

Each breakdown should be titled with the item name and number. The total should be the project or contract total as it appears in the grand total column on the summary of quantities.

Separate columns are used for quantity sheets that combine projects for letting as a single contract.

- *Summary of Quantities*. In this summary, each item used is listed in numerical order by pay item number. Entries are double spaced to allow for adding items during plans development. An additional column should be added to the left of the item numbers for listing the rounding included in the grand total quantity for each item.

A separate quantity column is required for each of the following types of construction.

- Roadway
- Bridges—each bridge or pair of bridges requires a separate column
- Nonparticipating items

Other column types may be required on a case-by-case basis.

If two or more projects are combined for letting as a single contract, a separate summary of quantities must be prepared for each project, plus a summary of quantities that shows the grand total for all projects. Roundings and detailed breakdowns are not required on this quantity sheet.

#### 5.2.2.6 Item Detail and Drainage Sheet

Detailed summaries of information on drainage, guardrail, curbs, and sidewalks are shown on this sheet. Totals of the various quantities are used in compiling quantities on the summary of quantities sheet. More than one sheet may be needed if the items are extensive.

An example item-detail-and-drainage sheet, in the appendix, shows the proper notations of the various details. The example sheet may need to be modified by the designer for a project's needs.

- *Drainage Items.* All details that pertain to drainage structures should be listed on this portion of the sheet. Quantities listed that are pay items are subtotaled or totaled, as the case may be, on each sheet. The depths of drop inlets are shown from the top of the grate or the seat of the cover to the inside floor of the drop inlet.
- *Guardrail.* The station-to-station location, side of roadway, length, and number of end treatments are shown on the portion of the sheet that is set up for rail items. The total lengths and number of end treatments are shown.
- *Curbs.* List the curbs by type: asphalt, granite, or concrete. Provide stations and locations in the summary.
- *Sidewalks.* Show the widths, stations, and locations of sidewalk.

#### 5.2.2.7 Miscellaneous Roadway Details

Special plan sheets are required to provide the necessary information on construction features, such as pavement transitions, lane tapers, gore transitions, intersection details, channelization, superelevation diagrams, railroad crossings, and minor structures, that cannot be clearly detailed on regular layout sheets.

- *Pavement Transitions.* Paving details of variable-width areas, such as intersections, interchanges, channelized areas, turnarounds, rest areas, and ramp terminals, should be included as part of plans preparation. Include such details as widths, thicknesses, slopes, rates of change in slopes, and spot elevations for the various items. Use VAOT standards for width and depth transitions. Details for transitions at the project termini should be included. Pavement Management recommends ways to terminate projects on a project-by-project basis.
- *Lane Tapers.* Use AASHTO standards. Use a larger scale for these drawings: 1:100 or 1:200.
- *Gore Transitions.* Use a larger scale for these drawings: 1:100 or 1:200. Details should show baseline information, pavement widths, shoulder transitions, and grade information at critical points. Proposed contours may be developed to clarify difficult grading areas, such as determining drainage flow.

- *Intersection Details.* Details such as warping and median nose details should be shown on this sheet. Also show the vertical and horizontal geometrics for large curb radii and turning islands. Grading details should be provided for areas not addressed by the typical sections. Use a larger scale for these drawings: 1:100 or 1:200. The sheets are used to coordinate utility and traffic signal pole locations.
- *Channelization.* Special plan detail sheets are necessary for all major areas of channelization. Pertinent information with respect to dimensions, elevations, construction items, and slopes should be shown on plans. Follow AASHTO design standards to establish channelized dimensions.

#### **5.2.2.8 Layout Sheets**

The layout sheets contain general project data, such as construction and drainage details.

- *Construction.* Show the edges of pavement, edges of shoulders, curbs, sidewalks, drives, all drainage structures, fencing, and other facilities to be constructed, as well as town and city boundaries, on the layout sheets. Stationing is plotted along each layout centerline. Except for special situations such as intersection reconfiguration, no physical survey is required for resurfacing. Layout sheets have no horizontal or vertical alignment, and the stationing scale is compressed. All pavement markings and signage are shown on the layout sheets, with reference to another applicable sheet if more detail is required.

Match lines should be used on the layout sheets to reference the matching sheet number. Proposed construction should not extend beyond the match line.

Abbreviations (codes) on plans should be easily recognized. To avoid misinterpretation, abbreviations should be identified in the VAOT *Standard Specifications* or on the layout sheet.

- *Drainage and Ditch Lining Information.* All pertinent details of existing and proposed drainage structures and ditches should be shown and noted on the special plan sheet.
- *Utility Routes.* Utility information is secured by the designer and incorporated into the layout sheets. Separate sheets may be needed for larger projects.

Show each construction note on every layout sheet where it is applicable. An attempt should be made to standardize the location of construction notes of various types and keep related construction notes together (for example, guardrail terminals of various types).

Other features of the layout sheet include the following:

- *ADA Features.* Handicap ramps are shown on the plans in accordance with Agency standards.
- *Railroad Crossings.* Railroad crossings are shown on the layout sheets, if appropriate. Separate sheets are necessary to show the construction details.
- *Permit Conditions.* Any areas not to be entered by the contractor must be identified on the layout sheets.

#### **5.2.2.9 Utility Sheets**

Utility sheets are used to present major utility adjustments and relocations on projects. Minor adjustments or relocations may be shown on the layout sheets. A tabular format may be used to indicate utility features and treatments.

#### 5.2.2.10 Traffic Control Sheets

The designer develops traffic control plans on all projects requiring advanced traffic control details over and above typical AOT details. Refer to the VAOT *Traffic Manual* for preparation of traffic control sheets.

#### 5.2.2.11 Signs and Lines Sheets

All work necessary to include sign plans, standards, quantities, and estimates as part of a roadway contract should be accomplished by the designer. Refer to the VAOT *Traffic Manual* for preparation of signs-and-lines sheets.

#### 5.2.2.12 Standard Sheets

Incorporate all of the required standard sheets into the plans. As noted in Section 5.2.2.3.2, certain standard sheets require the inclusion of other standards. Check Section 5.2.2.3.2 to ensure that all necessary standards are included.

Standard sheets are not numbered sequentially with other plan sheets.

### 5.3 DEVELOPMENT OF PLANS

#### 5.3.1 Steps

Three sets of plans are developed in sequence:

- *Preliminary plans* are complete with all details except for standard sheets. They represent about 75 percent of the total development effort.
- *Final plans* represent about 90 percent of the total development effort. They incorporate review comments on the preliminary plans.
- *Contract plans* represent 100 percent of the total development effort. They incorporate changes as the result of railroad and utility agreements, permit conditions, or comments from Contract Administration.

#### 5.3.2 Review of Plans

Preliminary plan sets are distributed by the consultant designer to the following for review and comment:

- Pavement Management Section
- Utilities Unit
- Construction Section
- Materials and Research Section
- DTA (district transportation administrator)
- Traffic Operations Unit
- Policy and Planning Division
- Environmental Unit, Technical section
- FHWA (Interstate projects only)
- City (Class 1 projects only)

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Notification of plan-set distribution is given to:

- *RPC (Regional Planning Commission)*. Plans can be reviewed in the DTA office.
- *Bike Pedestrian Coordinator*. Plans can be reviewed at Pavement Management.
- *MPO (Metropolitan Planning Organization)*. Plans can be reviewed in the DTA office.

Use a standard transmittal letter, as shown in the appendix. (The standard letter for receipt of plans is also in the appendix.)

For the review of final plans, the distribution of plans and notifications are the same as those for the review of preliminary plans, except that a set of plans is distributed to Contract Administration by the Pavement Management Section.

The Pavement Management Section serves as the clearinghouse for all comments from plan reviews. The Section collects, consolidates, edits, and summarizes the comments, including its own concerns, and returns the information and a “redlined” set of plans to the designer.

## **5.4 PAY ITEMS**

Guidelines for determining pay items include the Agency’s estimating guidelines and “Average Weighted Low Bid Price Guide.” Use the items needed to accomplish the full scope of the project. Special items are allowed; typically, they are closely allied modifications of the guidelines or standard modifications.

Optional and alternate items are allowed. For optional items, the contractor selects the item to use. Examples are different types of sign posts and bridge joints. For alternate items, the Agency selects the alternate to use.

## **5.5 COST ESTIMATES**

### **5.5.1 Item Quantities**

Item quantities are rounded according to the accepted process for rounding.

### **5.5.2 Unit Prices**

Unit prices are based on the current agency-wide average unit-price list. Example sheets from a unit-price list are in the appendix. The list provides price ranges, as well as graphs of quantities versus price. Select the price to use based on knowledge of plant and quarry locations, urban conditions, and other relevant factors. Generally, use higher prices for smaller quantities and lower prices for larger quantities.

Use the memorandums issued by Contract Administration for guidance in determining prices for non-bid items, such as price adjustments for asphalt.

### **5.5.3 Estimate Format**

The desirable estimate format has the items listed by ascending item number. The columns of the desirable format are:

- Item number
- Item description
- Unit
- Quantity
- Unit price
- Total price

The “total price” for the items should be summed, 8 percent should be added for contingencies, and 5 percent should be added for construction engineering. In addition, indicate the project length and the cost per unit length on the estimate.

An example format is in the appendix.

## 5.6 RIGHT-OF-WAY CERTIFICATES

The right-of-way certificate confirms that the State owns sufficient right-of-way to execute the project. For Class 1 town highway projects, the certificate covers from curb to curb. The certificate is composed by the Section’s Project Design Engineer and is signed by the Director of Construction and Maintenance. It is submitted with the contract plans. Two examples of right-of-way certificates are shown in the appendix: (1) municipality-owned right-of-way on a Class 1 town highway project and (2) State-owned right-of-way on a State project.

## 5.7 UTILITY AGREEMENTS

The AOT Utilities Unit works with utility companies to determine utility relocation or adjustments needed because of a project. The Section works from a list of projects provided by Pavement Management. There is no need for the consultant to request the Utilities Unit to perform its work for an individual project, although final plans may need to incorporate features covered in agreements.

## 5.8 CATEGORICAL EXCLUSIONS

The consultant prepares the documents for requesting a categorical exclusion (CE) and submits them with the preliminary plans. An example set of documents is in the appendix. The consultant submits the documents to the Environmental Permits Chief in the Technical Services Division. Permits evaluates the request and, if in agreement, submits it to the State Historical Preservation Office (SHPO). If SHPO agrees with the request, it rules that the project is exempt, has no effect, or has no adverse effect. If SHPO rules in any of these ways, Permits sends the request to the FHWA for evaluation. The FHWA may agree with a request early in the plans development process but may reevaluate the request if it has expired at the time the consultant submits the contract plans.

## 5.9 OTHER REQUIREMENTS

### 5.9.1 Salvage

Salvage requirements are determined during the review of final plans. The governing policy, “Disposition of Salvageable Material,” is included in the appendix, along with the “Memorandum for the Disposal of Salvageable Material” that is used to request input from the DTA.



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### **5.9.2 Field Office**

At the preliminary plan submission, the consultant provides the Construction Section with a request for a field office. The request form is in the appendix. The related pay items are included in the final plans.

### **5.9.3 Contract Duration or Completion Date**

At the preliminary plans submission, the consultant requests the Construction Section for a contract duration or completion date. The request form is in the appendix.

### **5.9.4 Traffic Control**

If traffic control needs exceed VAOT standards, a traffic control plan becomes part of the project plans. The traffic control plan is developed by the design consultant and reviewed by Traffic Design. Its necessity is indicated by the Construction Section on the form for requesting a field office. (See Section 5.9.2 above.)

### **5.9.5 Employee Training**

The project manager contacts the Office of Civil Rights and Labor to identify training requirements.

## **5.10 COORDINATION REQUIREMENTS**

Coordinating the project with DTA programs, other projects, etc., is performed by Pavement Management. (See Section 4.9.)

The project manager works with local governments to coordinate local projects and public events with the Pavement Management project. The coordination decisions are documented in the special provisions.

## **5.11 CONTRACT SPECIAL PROVISIONS**

Contract Administration typically identifies the need for special provisions at final plans review and composes and processes them. However, needs may be identified during the reviews of plans. The project manager advises the designer of special provisions that need to be drafted.

## Chapter Six

# Quality Assurance

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### 6.1 INTRODUCTION

The Pavement Management Section strives to provide quality in all aspects of pavement management: program delivery, program formulation, project plans, project construction, and program administration. Quality in the pavement management program stems from applying quality assurance and quality control to all parts of the Section's activity. The efforts involve all members of the Section. To be in concert with this goal, it is desirable that all consultant design firms have established some form of QC/QA program.

### 6.2 SECTION EFFORTS

The Section has a comprehensive and well-coordinated quality assurance program. The Pavement Management Engineer has established policies and procedures that set the tone for the remainder of the Section. Examples of the efforts include:

- Program performance standards are in place. Agency management reviews current performance status each year.
- Problems are addressed as they emerge. A collaborative effort involving experts in materials, construction, and design addresses needed improvements. Feedback from resident engineers regarding undesirable features of a paving project helps identify problems.
- New and improved materials and techniques result from consulting with engineering firms and attending specialty conferences.
- Information and education efforts target a wide variety of people. Legislative leaders and staffs of the Regional Planning Commissions (RPCs) receive briefings to make them aware of Section goals, intentions, and constraints. Each year, resident engineers receive briefings on paving program goals, the projects being awarded, and new emphasis areas.
- Partnering with the paving industry—
  - A “paving summit” with producers and contractors each December reviews the program for the next paving season. Representatives from the Agency's Construction and Materials units attend the meeting.

- Several meetings each year with the Paving Association of Vermont (PAV) review materials specifications and seek improvements in the performance of the paving products.
- Cooperative trial installations use new materials and techniques.
- Getting the most value for an expenditure—
  - Compare the proposed cost to design a project with earlier costs for similar projects before authorizing a consultant to proceed. A computer spreadsheet application aids in monitoring design costs. The spreadsheet contains data from several sources to provide considerable information on the project as well as the design contract. A copy of the spreadsheet is available to the Agency's audit unit for reference in auditing the costs claimed. An example consultant payment spreadsheet is in the appendix.
  - The proposed prices on contractor bids are scrutinized to ensure that they are comparable to those estimated by the designer and that, if a difference is observed, it is reasonable in light of project conditions.

### 6.3 PROGRAM QUALITY

The goal of Program Development is to produce programs of projects that use available funds to the best advantage. Some examples of steps taken toward this goal are:

- The pavement management program is fully integrated, encompassing preventive maintenance and resurfacing or rehabilitation of pavement on the network.
- Coordination with Agency program managers is continual, with the goal of avoiding conflicting work programs. The Section database (dROAD) contains information on the planned activities in other programs.
- Program information regularly goes to each district transportation administrator (DTA). Coordination with the DTAs is continual on their planned bridge, guardrail, culvert, and ditching work.
- Coordination with local government is continual to avoid surprises and ensure that there is the maximum amount of coordinated work by both parties. Examples include utility improvements, sidewalk enhancements, and street reconstruction.
- Coordination with outside organizations is very active to ensure that their views are known and recognized in the Section's program. Strong emphasis is placed on hearing from the Agency DTAs and the staffs at the RPCs.
- High-quality condition data and state-of-the-art analysis techniques are combined to select the appropriate treatment and location.
- Reaction from the Construction Section and Project Design regarding project scope is encouraged.

### 6.4 DESIGN QUALITY

The goal of Project Design is to produce contract plans that are clear and that reflect Section policy. Steps taken to support this goal include:

- Design guidelines provide direction to the consultant design firms. An example set of plans provides guidance on preferred practice. A program kickoff meeting is held involving all selected design firms to ensure that all receive up-to-date guidance on policy and quality expectations.
- A “seed file” for computer-aided design and drafting (CADD) is provided to the design firms so that plans have a consistent layout.
- Project Design reviews design work at the preliminary plans stage. It consolidates comments made by other Agency units. Municipal officials may review the plans for projects on Class 1 town highways. One representative plan set from each consultant’s annual output receives a detailed review.
- As time allows, Project Design conducts a field review of the plans and project area before completion of design.
- Feedback is encouraged from the Construction Section during regional training sessions and during construction, especially from the Section’s Paving Engineer.
- Designs specify SHRP climate-specific binders and incorporate the mix design features of Superpave.
- A design exception requires a sign-off by the Pavement Management Engineer and the Division Director. Consultant designers must submit design exceptions along with preliminary plan submittals. See the example request in the appendix.
- Annual performance evaluations are made of consultants under contract. Evaluations go to the Contract Administration Section. An example evaluation is in the appendix
- Design consultants are encouraged to annually submit their evaluation of Section performance.

## 6.5 CONSTRUCTION QUALITY

Much of the lifetime performance of a pavement depends on the practices and materials used in the course of construction. Steps and measures employed by the Section to secure the best possible quality include:

- A bonus-deduct provision for the price bid for mix included in the construction specification is based on ride quality surveys, by the condition survey unit, made on the wearing surface of each newly completed project.
- A bonus-deduct provision for the price bid for mix, based on compaction for Marshall designs, is aimed toward obtaining optimum performance from the pavement.
- A bonus-deduct provision for the price bid for mix, based on the air voids in the compacted mix, is similarly aimed at obtaining optimum performance.

*These quality control/quality acceptance specifications are based on Superpave. The contractor is responsible for testing to confirm all quality features, including field tests for compaction, in accordance with guidelines in the specifications. The Agency’s resident engineer specifies random locations for the field tests.*

- Construction-related problems, such as rapidly deteriorating construction joints, get high-priority attention. Improved techniques are developed in conjunction with the paving industry.
- The resident engineer issues change orders to deal immediately with design oversights and “lapses.” The Section fosters a strong, supportive relationship with the project resident engineers by providing quick response to questions and going to field locations if warranted by significant problems related to design oversights.
- The Section supports the Pavement Life Study by the Agency’s Research unit. In addition, the Pavement Management Engineer and other individual staff members informally track the performance of certain projects that involve trial materials or techniques.

## 6.6 PROGRAM OVERSIGHT

The FHWA makes periodic reviews of the Agency’s pavement management activities and the Section’s administration of the program. The normal FHWA focus is on the performance of the Section under the FHWA/Agency Stewardship Agreement and the Certification Acceptance Agreement. The Certification Acceptance Agreement effectively extends the Stewardship Agreement to those National Highway System (NHS) projects costing more than \$1 million, except for major bridge projects. Under these agreements, the Agency conducts all project-related activities in accordance with Agency and FHWA policies, regulations, and procedures.

The concurrence of FHWA is necessary on the plans, specifications, and estimates for all Interstate highway projects and major bridge projects on the NHS. Any design exceptions on these projects require approval by FHWA.

The Director of the Construction and Maintenance Division makes periodic reviews of the status of program development and project design activities. The primary interest is seeing that the activities take place on schedule. The Director’s interest also includes administrative activities, such as performance evaluations, budget preparation and current status, and strategic planning.

## Chapter Seven

# Contract Plans

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### 7.1 INTRODUCTION

Turning a designer's vision into work on the roadway requires careful preparation, both during the design phase and in preparation for the bid process. The contractor must be fully and completely aware of the detailed requirements of the project. The Pavement Management Section accomplishes this by presenting clear and detailed plans, with accompanying information, to allow complete specifications.

The public bid process applies to virtually all projects supported by the Pavement Management Section. The work goes to the responsible bidder who proposes the lowest total cost.

### 7.2 COMPOSITE PROJECTS

Two to four projects are frequently "bundled" into one contract. The objective is to provide a contract of meaningful dollar value and to provide opportunity for cost economy. Bundling also reduces the amount of administrative work during the bid-and-award phase.

Guidelines on bundling are straightforward:

- The projects should be in the same geographic area.
- The projects should be in the area supervised by one regional construction engineer.
- Class 1 town highway projects are typically not included with State highway or Interstate work, although a contract for work in any one city or village may have more than one project.

### 7.3 COMPOSITE PLAN SET

The set of plans for a composite project has a standard arrangement of pages. A typical plan set includes the following:

- Composite title sheet
- Composite index of sheets
- Composite quantity sheet(s)

- Project title sheet(s)
- Project typical sheet(s)
- Project detail sheet(s)
- Project quantity sheet(s)
- Project item detail summary sheet(s)
- Project layout sheet(s)
- Project traffic sign summary sheet(s)
- Project sign detail sheet(s)
- Project bridge quantity sheet
- Project bridge detail sheet(s)
- Construction approach signing sheets
- Agency standard sheets (as applicable and included by VAOT)

The latest approved Agency standard sheet must be used to avoid delays at this stage of project delivery.

The sample plan set in the appendix contains examples of the following sheets.

### **7.3.1 Composite Title Sheet**

The title sheet contains information that describes the location and scope of the work. Project location is described by narrative and by reference to a statewide map and also is shown on a large-scale line drawing.

The edition of the *Standard Specifications* under which the project was designed is mandatory information. This information is contained in the corner block in standard text for all projects.

The title sheet may contain the index of sheets for the set of project plans if the plans apply to a single project. If there are multiple projects in one contract, the index for the set of contract plans may be on a separate sheet.

The authorizing Agency director must sign the title sheet. If the project was designed by a consulting firm, the title sheet must have the professional engineer's stamp and the signature of a principal in the firm. A full-size Mylar sheet with the appropriate stamp and signature goes to the director for signature.

### **7.3.2 Composite Index of Sheets**

If it is not on the title sheet, a separate sheet contains the list of all sheets required to do the work on the project. List each separately titled sheet and its assigned sheet number. Those sheets with the same title or category may be listed with one title and a range of sheet numbers.

If a contract includes more than one project, all the contract sheets are numbered sequentially, with "blanks" left between the individual projects. Random "blanks" are left within the individual projects as the designer sees fit.

### **7.3.3 Composite Quantity Summary**

The composite quantity summary is a list of all pay items and both the estimated and designed quantities required to complete the work on the contract.

A pay-item description (title) must agree exactly with the description in the *Standard Specifications, Supplemental Specifications, or General Special Provisions*. A pay item must be "modified"

if its application in the project is different from that in the *Standard Specifications*, *Supplemental Specifications* or *General Special Provisions*. If an item is modified, its description is followed by the indicator “(Mod).” Designers should consult with the design management unit if a pay item cannot be found for work required.

Separate columns contain the pay quantities for all items applicable to the roadway, bridges, non-participating work, or other categories as needed.

If there is more than one project in a contract, pay quantities for each project are shown separately, along with the total pay quantity for the contract. Individual project numbers are the column headers, and there is a “grand total” header for the composite column. The designer must ensure that the individual project sheets and the composite sheet are consistent in terms of work items and quantities.

A summary breakdown of quantities, required only on the individual project quantity sheets, indicates where the design contemplates use of pay items. For example, bituminous concrete may be called for on drives, side roads, and main line (broken into leveling and wearing course, with applicable grades). Show the estimated quantity for each use.

A two-percent upward rounding is typically applied to quantities estimated as volumes. Show the rounding on the item detail. Unit pay items receive no rounding.

#### 7.4 CONTRACT ESTIMATE

The designer prepares a cost estimate for each project. The estimate and the project quantity sheet must be consistent. The format for the estimate is: item number, item description, unit of measurement, estimated amount (quantity), estimated unit price, and item estimated cost. The cost estimate is in the categories of roadway, bridge, and contingency (10 percent), as well as nonparticipating items. If a project is part of a composite contract, estimates are required for each individual project.

The designer should use the estimated unit price listed in the current Agency *Average Weighted Low Bid Price Guide*. The estimated price may vary from the *Price Guide* if the designer has reason to believe that project prices may vary. The designer must justify the use of prices that vary from the *Price Guide* by presenting a rationale for each item.

Project Design prepares an estimate for the contract from the project estimates and the quantity sheets using the HighEst software. Refer to the manual provided with the HighEst software for details on its use. An example HighEst estimate is in the appendix.

Once the contract estimate is prepared, Project Design updates Screens 34 and 444, Activity 450, in the Preconstruction Project Management System (PPMS). Advise the Pavement Management Engineer and the Pavement Design Engineer of the estimate amount by e-mail.

#### 7.5 REQUIRED DOCUMENTS

The designer must submit a complete package to the Project Design Unit:

- A complete “contract” set of full-size project prints, not including the standard drawings referenced. The full-size set is accompanied by a half-size hard copy set of reference plans.
- An original Mylar title sheet that has a professional engineer’s stamp and is signed by the engineer.



- The project cost estimate (one copy).
- The design computations (one copy).
- Project plans in electronic form. These files are in Microstation format, “zipped” (compressed), and placed on diskettes. Refer to the CADD guidelines for paving plans in the appendix.
- Explanation of any project special provisions required to clarify the work on the project. For instance, explain “Mod” items that supplement the *Standard Specifications*, *Supplemental Specifications*, or *General Special Provisions*.
- A memo signed by the Division Director stating that the project can be constructed within the currently controlled rights-of-way. This applies only to a project on a Class 1 town highway.
- A memo from the Agency’s Utilities Section identifying any affected utilities. The memo must state that the project can be constructed without interfering with any utilities; if there is potential for conflict, an agreement or conditions on doing the work must be attached. Most often this documentation is provided directly to the Contract Administration Section by the Utilities Section, based on a request submitted with the preliminary plans.
- If there is a railroad grade crossing within the project limits, a memo from the Agency’s Rail, Air, and Public Transit Division (RAPT) identifying the railroad operating company and the appropriate contact person. The memo must state the scope of any work near the railroad line. Request the information when submitting the preliminary plans. Attach the agreement signed by the railroad to the memo.

The Agency’s Contract Administration Section (C-A) negotiates the formal agreement with the railroad during the design phase, based on information provided by the RAPT Division. The agreement describes the crossing work and any project-related activities by the contractor. The C-A Section provides the agreement to the Project Design Unit.

- A categorical exclusion document (CE) relative to environmental impacts from the project. The document is secured through the Agency’s environmental permits unit. The CE is typically based on investigations done by the consultant designer.
- A salvaged materials form in which the appropriate Agency district transportation administrator (DTA) or other Agency official has indicated desires to retain any of the removed materials. The form is provided to the DTA with the preliminary plans review set. The DTA forwards the completed form to the Project Design Unit, which forwards it to the designer. The form indicates the materials requested and the locations to which they are to be delivered. Refer to the appendix for the Agency policy on salvage of materials.
- A field office requirements and estimated project completion date form. This form is provided to the Construction Engineer with the preliminary plans review set. The Construction Engineer forwards the completed form to the Project Design Unit, which forwards it to the designer.

Examples of the memos and forms mentioned above are in the appendix.

## 7.6 DOCUMENT PROCESSING

The Project Design Unit processes and takes administrative actions with respect to the documents received from the designer. This is in preparation for processing of the contract in the Agency’s

#### Contract Administration Section.

- The “zipped” diskettes containing the project plans are loaded into the Agency’s computer-aided design and drafting (CADD) system. Refer to CADD guidelines for detailed information on loading and naming the file.
- A work request transmittal form goes to the Agency Reprographics Unit by way of Groupwise, the Agency’s internal e-mail system. The transmittal form’s subject is “Request for Prints.” The transmittal form contains the file name and informs the Reprographics Unit of the directory where the project plans may be found. For example, if the project PPMS number is “95D486,” the file title is PD486\_CP.COM. The file is transmitted to the Agency Reprographics Unit with the path @ISRV02\PAVE\95D486\PD486\_CP.COM. Refer to the appendix for an example form.

Review the prints to ensure that CADD standards are appropriate. If satisfactory, the plans are retained in a reference file.

- The HighEst contract estimate is assembled and submitted to Agency C-A at server ISRV01 with a cover sheet. Transmit the estimate with the path @ISRV01\AUTOSERV\USERDISC\CONTRACT\COMMON\ESTIMATE. A memo by way of Groupwise to the C-A Contract and Specifications Engineer advises that a completed estimate has been submitted.

Using the HighEst estimate, a TRNSPORT estimate is prepared by C-A and forwarded to the design management unit for later use. Refer to the appendix for examples of HighEst and TRNSPORT estimates.

### 7.7 TRANSMITTAL

The Project Design Unit sends a package of documents to the C-A Section for processing before awarding the contract for the work. Hand-carry the package when all information is available and the Pavement Design Engineer indicates that funding is available.

The documents package consists of:

- A project submittal memo requesting advertising of the project, signed by the Pavement Design Engineer. An example memo is in the appendix.
- The signed original Mylar title sheet and one copy of the Reprographics-produced plans, not including standard drawings.
- Two copies of the TRNSPORT estimate. This is considered to be the engineer’s estimate.
- A project financing memo signed by the Pavement Management Engineer. To this attach a signed form CA-52, a copy of the paving map from the last annual *Paving Program Report* indicating the project location and the applicable page from the Agency’s Capital Program that contains the funding for the project. An example memorandum and CA-52 are in the appendix.
- The ROW-clear memo.
- The utility-clear memo and agreement.
- The categorical exclusion (CE) document.
- The railroad memo and agreement, if applicable.

- The salvaged materials form.
- The field-office-requirements form.
- The contract completion or duration form. The form establishes requirements for completion. A special provision is written by Contract Administration during contract processing to state a required contract completion date. If the date is not met, the Agency imposes liquidated damages per the *Standard Specifications*.
- Special provisions required for the contract. For example, explanation of any “Mod.” pay items.

All of the documents mentioned above are copied, and a “contract package” is placed in the project design folder for reference purposes during the construction phase. The folder goes to Construction Section at the time the project is advertised for construction bids. Following the construction phase and project finals, the folder goes to Central Files.

## 7.8 CONTRACT PROCESSING

### 7.8.1 General

The Agency’s Contract Administration Section (C-A) has extensive procedures for placing the work in the hands of a contractor. This manual is not intended to be a full description of the C-A process. Only those portions of the C-A process that affect the Pavement Management Section or are needed to understand the process are described here.

The C-A Contract and Specifications Engineer, who heads the Construction Contracting unit, reviews the contract package as received from the Project Design Unit. The presence of all required documents and material is confirmed.

The Construction Contracting unit does a cursory review of the package to assure consistency and absence of gross errors. If the package is in order, the preparation of the contract document begins.

The documentation required for a bid proposal includes:

- The set of contract plans, including standard drawings
- The proposal document, which becomes a contract for the project when signed by authorized representatives of the Agency and the contractor after contract award

The contract document has several key components:

- Boilerplate requirements on labor rates, civil rights, etc.
- A full list of the work items and the estimated quantity for each. The contractor proposes and the Agency accepts a set price per unit for each item.
- A copy of the applicable *Standard Specifications* book. The book is provided to the successful bidder.
- The current *General Special Provisions* and any required *Supplemental Specifications*. These provide modifications and clarifications of the *Standard Specifications*’ requirements and apply

to all contracts.

- The project (contract) special provisions. These may modify or clarify the requirements of the *Standard Specifications*, *General Special Provisions*, or *Supplemental Specifications*.
- A performance bond and a materials-and-equipment bond.

### 7.8.2 Special Provisions

The special provisions prescribe key requirements for the contractor. They may include the contract completion date, restrictions on doing the work, relations with third parties (local government, utilities, railroads, State maintenance work, or other contractors involved in the same area), and specific requirements for materials and methods related to or required in the work items.

Project special provisions are first published in final draft form. They contain “standard” modifications to the work items called for in the plans. The modifications may be due to a request from Pavement Management. They may be suggestions by one of the Agency’s technical units in response to problems perceived or encountered with respect to the *Standard Specifications* or *General Special Provisions*.

The C-A Section circulates the draft project special provisions to various Agency units for comment. The Pavement Management Engineer reviews the draft to ensure that the scope of work is clear, restrictions are proper, and specific requirements are consistent with the intent of the designer. The Engineer may delegate this review work to the Project Design Unit. Any discrepancies noted or suggestions are given to the C-A Section.

### 7.8.3 Bid Package

After receiving all comments, the C-A Construction Contracting unit completes the special provisions and is ready to assemble the bid package. This package is available to the prospective contractors for review and preparation of the bid proposal.

### 7.8.4 Advertising

The C-A Section prepares a notice of proposal. A copy is sent to the Associated General Contractors of Vermont. It is posted publicly and placed on the State Library System’s electronic bulletin board.

Interested contractors secure the bid package from C-A for use in assessing the project and preparing bids. Questions that the contractors may have are received by the C-A Section. Valid questions having significance to other prospective bidders result in an addendum being issued by C-A. Pavement Management will likely be consulted on the issue.

No questions should be entertained or answered by Pavement Management Section personnel. Any approaches by a contractor are to be referred to the Chief of Contract Administration.

### 7.8.5 Bids

At the announced time and place, the bids are opened and read in a public forum. Bids are accepted subject to analysis by the Agency.

The bid analysis consists of tabulating the work items and the unit prices to ensure arithmetic ac-

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curacy. The tabulation includes the engineer's estimated unit prices and the variance from the bid prices. It includes a comparative tabulation of all bidders' prices. The apparent low bidder is the bid with the lowest total price proposed to do the work.

#### **7.8.6 Bid Review**

The bid tabulations are forwarded to the Pavement Management Section as the proponent for the contract. The Section's duty is to analyze the bids and recommend action by the Division Director and the Secretary of Transportation.

The general rule for analysis is to determine whether the low bidder proposes a pricing structure that would be harmful to the Agency. For example, a quantity computation error may result in a large difference in the actual quantity of work. If the contractor's unit price is unreasonably high, the Agency could suffer a large loss due to the error. This is an "unbalanced bid" and is grounds for disqualifying the bid.

Expect many variations and circumstances in the bids. Each is evaluated, and a sensible recommendation is advanced that protects the interests of the public and the Agency.

A common situation is the receipt of a single bid. This requires a special analysis. The first question is the relation of the bid total to the engineer's estimate. The second question is the unbalanced bid issue noted above. If the total is below the engineer's estimate, a recommendation to award is in order. If the total is above the engineer's estimate, a careful scrutiny of the unit prices is required. Consult personnel in the Construction Section or the Materials and Research Section for background on project conditions, mixing plant location, etc.

Review the proposed unit prices for reasonableness, in light of the conditions imposed in the contract documents or other factors that would suggest that the bid is more reasonable than the prices in the engineer's estimate.

Assess the likelihood of receiving multiple bids in another award process. Consider the possible effect of the bid having been revealed publicly, relative to another award process.

After considering these and other factors as applicable, the recommendation is made either to accept the single bid or to deny it and rebid. If the project is rebid, it is advantageous to change the scope of the project by even a small degree.

The recommendation form is signed by the Pavement Management Engineer and the Division Director and then forwarded to the Secretary of Transportation.

An example recommendation is in the appendix.

## Chapter Eight Construction

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### 8.1 GENERAL

Construction is the culmination of the system analysis, program development, project design, and contract award processes.

### 8.2 ROLE DURING CONSTRUCTION

During the construction phase, the Pavement Management Engineer has responsibility for controlling project scope and cost.

During construction, the project resident engineer has the duty, responsibility, and authority to ensure that the work is carried out according to the plans and specifications. In accordance with the contract documents, the Director of Construction and Maintenance has authority to change the plans to address conditions encountered in the field. The Director delegates the authority, for most situations, to the resident engineer. The Agency's Construction Engineer, acting through a regional engineer and resident engineer, approves all changes to the plans and specifications.

The Pavement Management Engineer has limited involvement with any routine field changes and their cost implications. Any significant change or cost increase requires concurrence by the Engineer, as the Program Manager, or the Project Design Unit.

### 8.3 CONSTRUCTION SUPPORT

The Pavement Management Section is frequently called on to assist and support the resident engineer. This may entail interpreting the intent of the plans, confirming the need for additional work that is not called for on the plans, or reviewing a cost-saving feature that is identified by the resident engineer or contractor. The resident engineer normally contacts the Project Design staff for advice on how to proceed.

#### 8.3.1 Added Work

The resident engineer often notes desirable improvements to drainage facilities. For instance, clearing an obstructed ditch may extend the life of the pavement. Additional drop inlets may reduce ponding

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on the surface.

Requests for change in the scope of work may come from adjacent property owners or local government officials. Resurfacing of uneven sidewalks is a common request. Occasionally, the request is to install curbing to control drainage. Any change in scope requires approval by the Pavement Management Engineer.

The resident engineer frequently encounters the need to correct problems existing below the pavement. For example, a severe frost heave or an obvious subgrade failure may warrant the removal and replacement of the subbase and some subgrade material. Replacement of a failed culvert before resurfacing avoids disturbing a newly placed pavement. Fixes of this sort are obviously well beyond the scope of a paving project. However, it is not good engineering practice to leave a bad situation uncorrected, and the Pavement Management Engineer may approve of changing the project scope to address the situation.

### **8.3.2 Decision Making**

The resident engineer normally seeks advice regarding unusual circumstances. In significant situations, the Project Design staff views the situation in the field and gives advice. More frequently, the resident engineer phones the staff and discusses alternatives. In the most mundane situations, the resident engineer simply proceeds, using experience and judgment.

In only the most costly and controversial situations are the Pavement Management Engineer and the Director of Construction and Maintenance brought into the decision. Initially the resident or regional engineer discusses the situation with the Pavement Design Engineer or the Project Design staff, and they jointly develop a tentative course of action. The Design Engineer goes to the Pavement Management Engineer and obtains concurrence, which is returned to the Construction Section.

The Construction Engineer then presents the Director with a change of design or a supplementary agreement for approval, according to the guidelines established by the Director. The Director provides a copy of the document to the Pavement Management Section.

## **8.4 CONSTRUCTION QUALITY**

Construction quality starts with sound specifications and clear plans, based on well-tried policy and practice. The range of personnel contributing to construction quality includes designers, materials specialists, construction personnel, and industry representatives.

Construction Section management observes that ultimate project quality results from a partnering effort involving the resident engineer, the contractor's project superintendent, and the mixing plant manager.

Reaction to design practice has two primary sources: the impressions of Pavement Management personnel who visit the projects during and after construction and the input of the resident engineers and inspectors.

The Section always sends a representative to the project preconstruction conference and to participate in the final inspection. At the preconstruction conference, the Section's representative may offer comments or answer questions from the contractor or other personnel involved with the project.

The final inspection provides an opportunity to ensure that the work is in accordance with the design.

Either the Pavement Design Engineer or the Pavement Management Engineer reviews the work after receiving notice from the resident engineer that the project is ready for inspection.

During the final inspection, the Section's representative notes the results of any special treatments or design features. The representative frequently holds discussions with Construction Section management about what might have been done differently.

Section personnel make visits to projects during the course of construction as time and opportunity permit. Observations are useful, both of techniques and immediate construction quality relative to the specifications.

## **8.5 FEEDBACK**

Personnel in the Construction Section have extensive opportunity to observe both successes and failures. The Construction Paving Engineer sees every project several times during the active work. The materials inspectors and the construction inspectors provide important input. The resident engineer is intimately involved in all aspects of the project. Project reports and the memories of all the people involved serve to bring both successes and failures to the attention of management.

Construction personnel actively seek resolutions to problems that they identify. Sometimes, a joint inspection with the contractor's quality control specialist serves to identify appropriate corrective action or improvements for the future.

Regional construction closeout sessions serve as an annual forum. In these sessions, each project is reviewed to identify what went well and where there were problems. Ideas for solutions to the problems are sought. For example, a topic might be the problems with certain types of paving machines and the curative measures that worked. The Pavement Management Section design staff attends these sessions and brings back ideas for policy and practice.

Ideas that may be implemented through construction specifications are forwarded by the Pavement Management Engineer to the Specifications Committee.

## **8.6 CROSS-TRAINING**

An important means of bringing field issues into the office is the practice of cross-training by loaning Section personnel to be project inspectors. Problems encountered in the field as a result of scope and design practices prompt better solutions when similar circumstances arise on projects under design. A better end product results from use of informed design knowledge.





## Chapter Nine

# Maintenance

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### 9.1 GENERAL

The effects of weather and traffic loads work to shorten the useful lives of pavements. Maintenance activities serve to extend the useful lives at modest costs compared with resurfacing or reconstruction.

Maintenance responsibilities and programs involve both the Pavement Management Section and the Maintenance districts. The Pavement Management Engineer is responsible for the surfaces on the State highway system. The maintenance program administered by the Pavement Management Section is primarily preventive. The maintenance program administered by the Maintenance district organizations is primarily restorative.

A close working relationship between Pavement Management and Maintenance enables the assets and capabilities of each program to support the needs of the other, with resultant economies.

### 9.2 MAINTENANCE INDICATORS

The timing and type of maintenance that is needed for a pavement depend on its current and predicted short-term surface condition. The most current condition information is from firsthand observation by maintenance supervisors and Pavement Management's Program Development Unit.

Surface defects found in asphalt concrete pavement include potholes, edge breakup, cracking, depressions, rutting, and roughness. Quality goals indicate that these defects should be repaired.

#### 9.2.1 Potholes

Potholes are a common defect in thin pavement systems. They appear and develop in size and depth quite rapidly under traffic. The Maintenance district's forces decide when repair is necessary. Pothole repair is restorative maintenance.

#### 9.2.2 Edge Breakup

Deterioration occurs at the edge of pavement due to wheel loads and insufficient lateral or vertical support of the pavement. Edge breakup progresses into the traveled way if wheel loads are repeti-

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tive. Repair of edge breakup is restorative maintenance.

### 9.2.3 Cracking

Cracks develop and become wider over time, often taking several years to become significant. Intervention is desirable to prevent surface water from entering the pavement and subbase materials. In the subbase, the water contributes to deterioration by softening the materials, leading to undesirable surface deflections by wheel loads. In the pavement, water agitated by tire action causes stripping of binder from the aggregate, leading to weakened pavement.

Cracks in the pavement tend to aggravate local deterioration of the pavement surface by allowing sand particles to enter along with water. The particles prevent the crack from closing during warming months. The result is that more water and sand enter, and the crack becomes wider.

Surface water that is intercepted by a crack may freeze just under the pavement, causing “tenting.” This invariably results in additional cracks parallel with the original crack.

Water trapped within the pavement during cold weather freezes and fractures the pavement, which itself has lost all flexibility. Further water intrusion inevitably causes the development of a pothole.

Once cracks grow to the point that they join or intersect with other cracks, the development of potholes and general pavement deterioration is quite rapid.

Filling the cracks to prevent further water intrusion is a preventive maintenance measure that slows pavement deterioration. Filling may be accomplished by sealing (covering) the entire surface or by applying sealing material directly into the crack.

### 9.2.4 Depressions

The deflection in a roadway that is caused by a wheel load does not fully recover when the subbase is soft. Under repeated loading, the deflected area eventually grows to a large depression, possibly 50 mm or more deep and of sizable extent. It is not feasible for maintenance forces to clean snow from the surface, water puddles accumulate, and ride quality is noticeably reduced. Filling with a leveling course is an appropriate temporary restorative measure.

### 9.2.5 Roughness

Roughness is usually caused by movement within the roadway structure, in the pavement, subbase, or subgrade. It generally develops over the course of several years. Shoving of the pavement occasionally occurs at intersections where vehicles stop. Corrugations transverse to the wheel path are the primary symptom. Movement in the subgrade may stem from uneven movement caused by frost action, ice lenses, or swelling of clay layers. Smoothing with a leveling course, or grinding smooth and leveling, are appropriate temporary restorative measures.

### 9.2.6 Rutting

Rutting is usually the result of lateral movement, but may be the result of increased compaction of unstable pavement material under slow-moving or static wheel loads. Most often, long-distance rutting is the result of the loss of air voids in the asphalt concrete caused by improper mixing or compaction during the lay-down process or from the use of a soft asphalt. Rutting may also occur as the result of a weak pavement structure and weak subbase that are subjected to high ESALs. Depending on

the cause, ruts may be leveled (filled), or a mill-and-fill treatment may be necessary.

## 9.3 MAINTENANCE PROGRAMS

The goal of activities classified as maintenance is either to restore the surface to a serviceable condition or extend the life of the pavement. Maintenance activities are classified as routine or preventive, and both are included in a pavement maintenance program. The FHWA publication, *Pavement Management Effectiveness*, FHWA-SA-96-007, is a reference for the development and management of a pavement maintenance program.

### 9.3.1 Routine Maintenance

As noted previously, the focus of the Maintenance district forces is primarily restorative in nature. Restoration work includes filling potholes, repairing pavement edges, smoothing depressions, and occasionally leveling larger areas.

#### 9.3.1.1 Potholes

The Agency uses high-performance patching materials on the premise that they provide a better-than-temporary repair at very little cost if compared with repeated repair work. These products require minimal preparatory work and installation effort, which greatly aids productivity. Funding is provided from the appropriation for maintenance of highways.

#### 9.3.1.2 Leveling

Leveling is a short-term maintenance technique designed to fill depressions, smooth rough areas, and fill ruts. The technique is to place a layer of asphalt concrete over the area, tapering it into the existing pavement so that ride quality is regained. Leveling is done by a skid box or a paver, using Type III or Type IV asphalt-concrete hot-mix. A steel-wheeled roller compacts the material.

If large areas are to be leveled, contractor equipment and personnel may augment the district workforce.

Funding may be provided by the maintenance or paving appropriation.

### 9.3.2 Preventive Maintenance

Preventive maintenance is an integral part of the Agency's pavement management system. The focus of preventive maintenance is on the midterm of a pavement's expected life, before substantial deterioration has occurred. Applied under these circumstances, successive applications of preventive maintenance extend the life of a pavement for many years.

The FHWA publication FHWA-SA-96-027, *Pavement Maintenance Effectiveness: Preventive Maintenance Treatments*, is a good reference and provides a thorough treatment of this topic. Several techniques and approaches to preventive maintenance are presented.

Preventive maintenance projects are managed and funded by the Pavement Management Section. The projects are intended to delay the need for costly resurfacing treatments or frequent restorative work. Contractors normally do them.

It is difficult to estimate exactly how many extra years of life are gained by active preventive maintenance. The timing of the maintenance, the subsurface conditions, the ESALs, and the quality of

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the initial construction all enter into the question. A preventive maintenance program is not fully effective on a roadway with a weak subbase or one subject to frost heaves.

In practical terms, a preventive maintenance program on a typical 100-mm asphalt concrete pavement structure over suitable subbase starts with a crack-fill operation in the third year after its construction. In the eighth year, repeat the crack-fill operation on any newly developed active cracks, repair deteriorated or damaged crack filler, and seal the inactive cracks. Repeat this crack-fill operation and, if the surface is showing signs of binder deterioration, do a full surface seal in the twelfth year. Repeat the crack fill/seal process for as many cycles as needed until rutting or some other defect indicates that resurfacing is necessary.

Preventive maintenance projects fall into two types: crack-filling and surface sealing. Deciding which to use is a function of crack density.

#### **9.3.2.1 Project Selection**

The need for and type of crack treatment is determined with information that is secured by the automated condition survey, supplemented by observations of the district personnel and Pavement Management's program development unit. Field review supplements the automated survey to confirm the amount and type of cracking and establish the limits for scheduled work.

Age is a primary indicator for crack filling. Reflective cracks often appear during the first winter following resurfacing. Thermal-induced cracking may appear in new pavements in the second year following construction, depending on the thermo-resiliency of the bituminous binder.

Experience has shown that although cracking occurs during the first or second winter following construction, the width of cracks is not sufficient to warrant treatment until after the third winter. Usually a high proportion of the cracks are 5 mm wide by that time.

The dTIMS pavement management software has the ability to select preventive maintenance projects. Selection is further refined by district and Section employees.

#### **9.3.2.2 Crack Filling and Sealing**

The FHWA publication FHWA-PD-94-084, *Asphalt Pavement Repair, Manuals of Practice*, SHRP-H-348, contains a detailed methodology for conducting a crack treatment program involving both crack filling and crack sealing. The publication makes a distinction between the two treatments, based on crack activity, but materials and practices are the same.

Crack filling relates to cracks that "work"; that is, they exhibit movement due to seasonal temperature shifts. Crack sealing applies to treatments for the "non-working" cracks. Due to difficulty in deciding which cracks "work" and those that do not, the usual practice is to treat any crack as "working" and to provide a crack-filling treatment.

Agency practice is to distinguish between crack sealing/filling and surface sealing based on the extent of cracking. Sealing over the entire surface area with a thin hot-mix asphalt overlay is considered if cracking is so extensive that filling operations will effectively coat over five percent of an area that is 5 meters or more long and 2 meters wide. Frequently, both crack treatments and surface sealing activities may be necessary on a given stretch of roadway.

A reason for this practice is that filler material is considerably more slippery than the usual AC surface. This makes for hazardous riding conditions during wet weather for bicyclists and motorcyclists. Another reason is that extensive crack-filling is uneconomical relative to a thin overlay.

### 9.3.2.3 Special Problems

Asphalt concrete overlays on PCC pavement are particularly susceptible to reflective cracking at the slab joints. Some of the joints in PCC are quite active, and selective crack-filling is frequently needed after the first or second winter following the overlay construction.

The slabs in PCC may “migrate” significantly and create a wide opening along the centerline. This creates a need for special treatment of the opening, usually cleaning accumulated debris and filling with hot mix.

Widening of PCC pavements with an asphalt construction has been practiced on some routes. The widened area may fail prematurely, usually requiring leveling or shimming of the area to raise it to that of the adjacent pavement. This probably will be needed after five to ten years.

Longitudinal cracks or openings at the cold joints in an overlay are a special problem. Early onset of the problem indicates poor compaction in joint areas. Sawing or milling out an area may be necessary before replacing it with the original type and depth of overlay material. Sealing the crack is essential if the material is not replaced.

Another special problem is the settlement or shoving of asphalt concrete pavement widening because of truck traffic. Early failures typically result from inadequate base compaction or subbase materials, resulting in cracks at the edge of the original pavement. Remedies range from leveling the widening to reconstructing it.

Rutting in the travel lane of a freeway is a common problem. This may be treated by filling the ruts in lieu of a rehabilitation project. Microsurfacing or Type V asphalt concrete are possible filling materials. In this way, the defect in the travel lane may be corrected, avoiding the necessity of work on the passing lane.

### 9.3.3 Crack Filling

Crack filling is appropriate if a large proportion of the crack length is well developed and the pavement adjacent to the crack has not deteriorated. Once cupping (depression adjacent to the crack) or active cracks in the adjacent area have developed, it is too late. Ride quality is severely diminished, stripping may be occurring within the pavement material, and a curative measure is required, rather than a maintenance measure.

There are two essential elements for successful crack-filling:

- The crack must be properly prepared.
- The proper filler material must be used.

Failure to observe both elements invariably leads to failure of this maintenance measure.

Crack filling is most effective on thermal or transverse cracking. Longitudinal joints that result from construction activities benefit from crack filling, while longitudinal cracks resulting from fatigued pavements are generally not good candidates. Cracks that are between 3 mm and 25 mm wide are the best candidates.

Longitudinal cracks or openings, which are related to cold joints in the pavement or other construction-related problems, are treated when they appear. Other longitudinal cracks receive the same attention. Many agencies recommend no attention be given to these cracks, on the premise that they are due to subsurface problems that continue despite maintenance. VAOT practice is to treat these

cracks because to allow water intrusion is to encourage rapid deterioration of the pavement during freeze-thaw cycles. Longitudinal cracks are given proper preparation and then flush-filled with no over-band.

Cracks in open-graded friction-course pavements are a special problem. Transverse cracks may be properly prepared and flush-filled. No longitudinal cracks are to be filled (other than at the high point in a crowned cross-section), because to do so interferes with the internal drainage feature of the open gradation.

#### **9.3.3.1 Crack Preparation**

Mechanical shaping of a crack is a necessary part of preparation. The mechanical shaping should result in a square reservoir at the surface, 10 mm to 20 mm wide and equally as deep. The crack is then thoroughly cleaned, dried, and heated.

#### **9.3.3.2 Filler Material**

The Agency's standard filler material is a rubberized asphalt. It is hot-applied with a thin and narrow over-band in most situations. The width of over-band should be limited to 50 mm. The depth of over-band is limited to a thin film of less than 3 mm over the existing pavement. A flush-fill may be used if the uneven surface appearance of over-banding is not acceptable or if there is concern about creating a slippery surface.

#### **9.3.3.3 Material Requirements and Cost**

For preparing programs of projects, use the following estimating factors.

- Transverse cracking only: 335 kg per lane-km
- Moderate cracking in a thin overlay: 420 kg per lane-km
- General cracking, both transverse and longitudinal: 560 to 700 kg per lane-km
- Heavy block cracking: 840 kg per lane-km

Productivity is about three lane-km per day per crew.

#### **9.3.3.4 Service Life**

Service life of crack-filling may be as short as two years or as long as seven years. As reported by ERES Consultants, Inc., in a July 1996 publication, *Long-term Monitoring of Pavement Maintenance Materials Test Sites*, observations made during the SHRP long-term monitoring program found that crack-filling, using the configuration and materials described above, was 75 percent effective after four winters. Failure occurred to a very small degree during the first three years following installation and then accelerated in a typical degradation model. Failure mode was mostly adhesion loss, but only where crack movement exceeded 7 mm at the highest recorded locations. Very similar results have been recorded in Agency research installations.

Repairing failed crack filler is as simple as removing debris with compressed air and then placing new hot-poured material in the opening. Bond is usually very good with preexisting bituminous crack filler.

Excessive crack movement is the primary cause for failure in any crack-filler material. Those cracks that exhibit early failure may need a treatment that provides for greater movement capacity. Improper technique during initial installation of crack filler may also be cause for failure. Removal and installation of new material may be necessary.

### **9.3.3.5 Specifications**

Item 417, “Bituminous Crack Filling,” is the appropriate pay item.

## **9.3.4 Sealing**

Surface sealing has the same objective as crack filling: to prevent or reduce the intrusion of water into the pavement and retard its deterioration.

Sealing is considered if an area has a high density of cracks. If so, a seal is applied to the larger area, covering the full lane or roadway width. If there is a high density of cracks with considerable edge deterioration or depressed areas, sealing provides only a limited gain in pavement life. Rehabilitation in the form of an overlay or other substantial treatment is a necessity.

The seal may be a liquid type, such as a chip seal, a sand seal, microsurfacing, or a slurry seal. A fog seal is a potential treatment for open-graded friction-course surfaces. If the liquid type of seals are used, the cracks must be prepared and filled in advance. The more usual and generally preferred seal in the Agency is a thin overlay of hot-mix asphalt concrete. Not only is the surface area sealed, the overlay may also accomplish some degree of leveling. If warranted by roughness or cross-section problems, a localized preliminary leveling course may be applied before sealing.

### **9.3.4.1 Seal Preparation**

Preparation for AC sealing consists of flush-filling cracks that are 25 mm or larger and filling depressions with pothole repair material or hot-mix asphalt pavement material. Broom any sand or other loose materials off the surface and from the topmost portions of the cracks. Apply asphalt-emulsion tack material over the entire area before placing the seal material, except if a liquid seal is used.

### **9.3.4.2 Seal Materials**

The preferred material for a thin overlay is a Type IV asphalt concrete, placed with a depth of 15 mm to 20 mm. Alternatively, a very thin overlay of Type V asphalt concrete, placed with a depth of 10 mm to 15 mm, may be used if no leveling is required.

Alternative seal materials include chip seal, slurry seal, and microsurfacing. Chip seal use is restricted to very low-volume roadways with little bicycle traffic.

### **9.3.4.3 Specifications**

Item 406, “Bituminous Concrete Pavement,” is the appropriate pay item for sealing with a thin overlay. Indicate the necessary preparation in notes on the plans or in special provisions.

### **9.3.4.4 Service Life**

Service life for a seal is approximately four years for a liquid seal and four to eight years for a thin overlay. It may be more or less because of the subbase and pavement conditions prior to sealing. Some localized lifting of thin overlays may occur, but this does not materially affect the performance of the seal. Reflective cracking through the seal is expected, and crack filling may be required after the third winter of service.



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# Appendix

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Figure A-1

## **Section Administration**

The Pavement Management Engineer is responsible for the completion of all duties and tasks of the Section. The Engineer is the only position classified as “managerial” in the Section. The Engineer is responsible for ensuring that both technical and administrative functions occur in an efficient and effective manner.

The Section has no integral or assigned clerical personnel. Members of the Section are expected to answer their phones, maintain appointment schedules, make copies, send fax messages, maintain files and prepare correspondence with their computers. Limited clerical support, such as backup phone answering, is available from the Director’s administrative assistant.

Computer files are to be indexed and regularly backed up.

The Section’s principal administrative functions and the associated tasks are as follows:

### **Planning**

- Participate in and support Agency-wide and Division planning activities.
- Perform administrative and programmatic efforts that need to be undertaken—strategic plan updates, for example.
- Anticipate future resource needs and develop means to address them.
- Plan and program paving activities ranging from preventive maintenance to reconstruction.
- Produce annual programs of projects to accomplish the activities.

### **Communication**

- Attend division-level staff meetings and report on progress, issues encountered, and needs identified.
- Attend Section and unit staff meetings to discuss information from the Division and to plan activities.
- Provide information to other Agency offices to support continuous coordinated Agency operations.
- Make presentations to groups such as legislative committees, the paving industry, and public bodies.
- Answer requests for information.
- Publish an annual report on the status of the network and proposed activity.
- Liaison with FHWA on program stewardship and project details, as provided in the *Vermont Stewardship Guide*, the *Certification Acceptance Agreement*, the Agency’s “Interim Policy on Resurfacing,” and the *VAOT 3R Policy*.

*Figure A-1 (continued)***Section Administration**

- Attend users group and management conferences.

**Financial**

- Prepare annual detailed budget request based on targets received.
- Maintain constant status of appropriated funds.
- Make periodic forecasts of funds drawdown and anticipated end-of-year balances.
- Accomplish routine transactions, such as time reports and expense accounts, contractor invoices, equipment usage reports, and vendor invoices.

**Procurement**

- Requisition supplies and small tools from the Agency's stockroom.
- Request purchase of larger items from vendors by the Agency's office services unit.
- Coordinate purchase of new and replacement equipment with the State Garage Superintendent.
- Prepare scopes of work for consultant services for use by Contract Administration and request issuance of requests for proposal.
- Prepare plans and specifications for contract paving work for use by Contract Administration.

**Personnel**

- Request position classification actions.
- Request recruitment actions to fill unit vacancies.
- Interview and select candidate employees.
- Plan and program training to enhance performance of staff members.
- Monitor employee performance and provide periodic performance evaluation and counseling.

**Supervision**

- Monitor accomplishment of program development milestones based on frequent reports from unit heads.
- Ensure that unit heads maintain close contact with each other and their employees to ensure coordinated approach to accomplishing Section goals.

Figure A-2

## Scope Statement for Design RFP

Rev. November 10, 1997

### VERMONT AGENCY OF TRANSPORTATION PAVEMENT MANAGEMENT SECTION

#### SCOPE OF WORK FOR CONSULTING SERVICES FOR THE DESIGN OF HIGHWAY RESURFACING PROJECTS

##### I. Purpose of Contract

The Vermont Agency of Transportation (VAOT), Pavement Management Section (PM), intends to retain the services of consulting engineering firms under a multi-year retainer contract to prepare project plans, required environmental documentation (generally categorical exclusions), required special provisions, and cost estimates for resurfacing work on Class 1 town highways, State highways, and Interstate highways in Vermont. These projects may involve pavement surface improvements, pavement markings, sign updating and/or replacement, upgrading guardrail, minor drainage improvements, and related items. Other projects may be scheduled for preventative maintenance, including work such as crack filling, surface sealing and overlays. No right-of-way acquisition or construction inspection services are required. Review of project-specific shop drawings are part of the services required.

##### II. Development of the Project/Proposal Requirements

- A. 1. Project development shall, as directed by the Pavement Management Design Engineer, be based on the applicable concepts as outlined in either the *AASHTO Policy on Geometric Design* (1994 Edition) for the Interstate System, the *Revised Vermont State Standards*, dated July 21, 1997, for State highways, the *VAOT 3R Policy—Metric Version*, dated December 2, 1992, and other related material attached to this document: the "Interim Policy on Resurfacing," dated January 31, 1992 (Rev.), or the "Preventive Management Policy," dated May 15, 1997.
2. A typical project description, location, and limits are as described in Attachments A1 and A2. Projects of this nature are typically based on the "Interim Policy on Resurfacing," as outlined in Attachment B. Addendums have been attached to the "Interim Policy on Resurfacing" that outline the "Design Objectives on STP Paving Projects," "VAOT's Guidelines for Bridges and Bridge Rail on STP Projects," and the VAOT "Preventative Maintenance Policy."

On a less frequent basis, projects require improvements that enhance those described in the "Policy on Resurfacing" (Attachment B). These enhanced improvements may include (but not necessarily be limited to) base or subbase restoration, minor widening, sight distance improvements, superelevation improvements, and drainage work, all of which are described in the *VAOT 3R Policy—Metric Version*, dated December 2, 1992. Although the improvements described in the *3R Policy* seldom apply, a copy is attached (Attachment C) for information purposes only.

Once under contract, for specific project assignments, the consultant is required to provide to the VAOT a labor-hour estimate, cost estimate, and schedule to develop preliminary plans, final plans, contract plans, cost estimate, and special provisions for features unique to the project. The labor hours and cost estimate associated with researching resource impacts, preparing the necessary documentation to obtain the required permits, and preparing the environmental document (categorical exclusion) shall be separated from the remaining tasks yet shall be included in the overall contract cost and schedule. All estimates and schedules shall be in formats as accepted and approved by the Pavement Management Design Engineer, as shall be all invoice statements that may be submitted upon successful procurement of a contract under this scope of work.

Figure A-2 (continued)

### **Scope Statement for Design RFP**

The consultant must receive written approval from the Pavement Management Design Engineer of any and all estimates/schedules prior to amassing any charges to a project. The cost estimate for any particular project shall be considered by the Agency to be the maximum limiting amount (MLA) for that individual project. Any over-expenditure of the MLA shall be documented by the consultant in a resubmission to the Pavement Management Design Engineer for consideration. This resubmission shall include discussion on the justification of the over-expenditure, the original proposal figures, anticipated overages, and the revised proposal figures. Charges accumulated over and above the original MLA will not be processed by the Agency until the justification for those over-expenditures has been reviewed and approved.

Attachment D provides a copy of the categorical exclusion document and environmental analysis sheets that list all of the environmental issues that need to be addressed during preliminary design. These analysis sheets must be completed as part of the categorical exclusion. The typically provided scope material of Attachment E will be used as a basis for providing the above information.

B. Specific projects covered by this contract will be developed in two phases, as noted below.

Phase I Project survey, preparation of project plans, analysis of resource impacts, preparation of required permitting documentation, preparation of the environmental documentation (categorical exclusion), construction cost estimate, and project special provisions for features unique to the project and as required by the Pavement Management Design Engineer

Phase II Engineering services during construction

### **III. Phase I. Project survey, preparation of project plans, analysis of resource impacts, preparation of required permitting documentation, preparation of the environmental document (categorical exclusion), construction cost estimate and any required special provisions.**

A. Data Collection and Field Survey

An initial program design conference will be held prior to beginning any project survey and design. This conference, which will be scheduled and chaired by the Agency, will be held in the VAOT office in Montpelier, VT, to discuss design criteria, scope of field survey required, plan development, and other related topics (such as signs and pavement markings). The Pavement Management Design Engineer will distribute a conference agenda to those firms that submit successful proposals under this program. The consultant will document this conference and distribute a copy to the Pavement Management Design Engineer for concurrence in understanding the program requirements.

The Agency will furnish the consultant the following information on each project, which may consist of one or more highway segments.

1. Scope material for each segment:

- a) Initial field review notes
- b) Project limits (length and location)
- c) Pavement structure treatments/improvements
- d) Traffic data
- e) Existing pavement marking information (if available; these will be reviewed for compliance with latest VAOT guidelines)
- f) Special treatment areas

Figure A-2 (continued)

### Scope Statement for Design RFP

- g) Bridge treatment information
- h) Other preliminary plans or documents (if any)
- I) Pavement coring information, if applicable

The consultant will schedule a time in the VAOT office to secure copies of all required route logs and accident reports. Record plans are available for viewing/copying, at a scheduled time, to obtain existing roadway/bridge/right-of-way information. The consultant will be ultimately responsible for investigating the existing ROW widths and, as part of the final plan submittal, will certify that the project, as designed, can be constructed entirely within the existing right-of-way.

2. To assist in the project design and estimates, one copy of:
- a) Unit price list for preliminary engineering estimates
  - b) Sample contract plans
  - c) Sample special provisions
  - d) Sample preliminary estimate
  - e) VAOT *General Special Provisions* for all projects (1995 Specs)
  - f) VAOT *Standard Specifications for Construction* (1995 Edition)
  - g) VAOT standard sheets (Metric)
  - h) Pavement Management Microstation seed file and assorted details
  - I) High accident location analysis procedures.

New *Standard Specifications for Construction*, when issued by the Pavement Management Engineer, shall be used for project development as required during the life of this contract.

3. As applicable, design criteria will include the following:
- a) AASHTO *Policy on Geometric Design* (1994 Edition) for Interstate System design
  - b) The *Revised Vermont State Design Standards*, dated July 21, 1997, for highways of the State (including those on the National Highway System)
  - c) VAOT *3R Policy—Metric Version* (dated December 2, 1992)(Attachment C)
  - d) VAOT “Interim Resurfacing Policy (Rev.)” (dated January 31, 1992) including the “Design Objectives on STP Projects,” “Guidelines for Bridges and Bridge Rail on STP Projects,” and “Preventive Maintenance Policy” (See Attachments B with attached addendums)
  - e) 1988 MUTCD or latest revisions
  - f) VAOT *Design Manual* and supplementary guidance
  - g) VAOT *Bridge Manual*
  - h) 1989 AASHTO *Roadside Design Guide*
  - I) VAOT “Sign Design Guidelines”
  - j) VAOT “Sign Post Design Guidelines”
  - k) VAOT “Pavement Marking Placement Guidelines”
  - l) VAOT “Street Lighting and Signal Design Guidelines”
  - m) VAOT “Traffic Control Design Guidelines”
  - n) ADA “Accessibility Guidelines”
  - o) AASHTO *Guide for the Design of Pavement Structures*

The consultant shall investigate the existing project area, determine deficiencies, evaluate alternatives, and make recommendations as to the work to be performed on this project. The consultant shall field review each project to familiarize him/herself with the existing conditions. This initial investigation shall include the researching of local ordinances, a copy of which will be provided to the Pavement

Figure A-2 (continued)

### Scope Statement for Design RFP

Management Design Engineer. Locations of all existing pavement markings (which shall be reviewed for compliance with the latest VAOT guidelines), guardrail, driveway openings, surface and subsurface utilities (buried utilities that might be damaged by shoulder excavation, ditch cleaning, guardrail installation, etc.), curb limits, lane and shoulder widths, untraversable objects, signs associated with pavement markings and side roads, sidewalk ramps, and bridges shall be determined so that they can be accurately indicated on the project plans. Additional information or field level (elevation) survey may be necessary to determine or verify items such as roadway superelevation, guardrail limits, need for additional right-of-way, existing utility locations, etc. The need for this additional field level information is generally not required for paving projects but may be required if the project is expanded to include 3R objectives.

Signs, sign supports, traffic control signals, and pavement markings may be upgraded to design standards for new construction in accordance with the MUTCD and VAOT supplements, policies, standards, and guidelines unless these features are specifically excluded from the project. The accommodation of pedestrian and vehicular traffic during construction will be addressed as a part of plans development in accordance with those same sources. Normally, on paving projects sign replacement is limited to those associated with pavement markings and side road intersections with traffic signal design limited to the installation of vehicle loop detectors, pull boxes, and other minor maintenance work; however, additional sign and signal work may be added if the project is expanded to 3R objectives.

Several, but not all, of the issues that are to be addressed in this phase of the project are the determination and/or definition of:

- a) Typical roadway section(s) / width (s)
- b) Drainage improvements (typically limited to surface drainage features)
- c) Treatment of high accident locations
- d) Analysis and treatment of guardrail
- e) Conformance with Americans with Disabilities Act of 1990
- f) Identification of private and/or public utilities
- g) Design exception needs (not generally required with STP paving projects, but may become necessary on 3R projects)
- h) Identification of potential resource impacts (historical, archaeological, wetlands, agricultural land, etc) (Refer to Attachment D, "Environmental Analysis Sheets," for a listing of the resources requiring analysis.)

#### B. Plan Development Process

The VAOT will furnish the consultant with a list of individuals and offices to whom the consultant will submit plans for review and comment of preliminary plans, final plans, and contract plans. All plans submitted to the VAOT shall include design step terminology as per Agency policy, dated December 10, 1992 (included as part of Attachment E). The date of printing of plans sheets shall be stamped or otherwise shown on the title sheet. If required by the Pavement Management Design Engineer, the consultant shall organize a meeting with all reviewers to resolve comment conflicts. The consultant shall present to the Pavement Management Design Engineer a written summary of the meeting minutes, such that decisions may be made and conflicts resolved. The consultant shall document the decisions resulting from this meeting and summarize any action required by the VAOT, town, consultant, etc., to allow design to proceed.



## Scope Statement for Design RFP

### 1. Preliminary plans

- a) Complete plans and a construction cost estimate will be prepared and submitted directly to official reviewers. Plans will consist of title sheet, typical section sheet, quantity sheet, item detail summary sheet, project layouts that list the major construction items (including drainage features, guardrail items, curb and sidewalk items, etc), the locations of the VAOT-provided pavement coring information and all pavement marking details (including center line, edge lines, intersection details and special markings), traffic sign sheets and details, construction signing sheets and details, and other project specific details as required. An analysis of any VAOT identified high accident locations will be required at this stage. Individual projects may require consolidation into contract groups as directed by the Pavement Management Design Engineer.

All reviewers shall be given ten working days from the day of submittal for review. In an effort to avoid conflicting comments the consultant will advise reviewers to return all comments to the Pavement Management Design Engineer for consolidation and forwarding to the consultant. At this point, the submittal to the Pavement Management Design Engineer will indicate any required deviations from the applicable design standard of Section III.A.3 and, thus, requiring a design exception. As stated in that section, design exceptions are generally not required with STP paving projects but may be required on 3R projects.

- b) In conjunction with the development of the preliminary plans, the consultant shall investigate the impacts to resources associated with the project design.

If impacts to resources are determined and avoidance is not feasible, the consultant shall prepare the necessary documentation to obtain the required permits and/or clearances for the impacted resources. A list of resources that will require evaluation is included in Attachment D, the categorical exclusion environmental analysis sheets. Completion of the categorical exclusion shall occur once all resource impacts are known. The Section 106 Formal Comment Letter of Concurrence by the Vermont Division for Historic Preservation must accompany the categorical exclusion document. Copies of the historical and archaeological consultant assessment shall be sent to VAOT Director of Technical Services for review and preparation of the Formal Comment Letter. Upon completion of the categorical exclusion, the consultant shall provide one copy to the Pavement Management Design Engineer (with an electronic diskette (3.5 inch) of the document) and one copy to the VAOT Director of Technical Services for review. Once review is complete, assuming that no changes are required, Technical Services will submit the categorical exclusion to FHWA for approval. The categorical exclusion should be approved before final plan design commences.

### 2. Final Plans

After all preliminary-plans comments have been consolidated by the VAOT, they will be forwarded to the consultant. The consultant will adjust the plans to incorporate any permit requirements and the provided preliminary-plans comments and shall submit complete plans, cost estimate, and special provisions for features unique to the project for a final review. At this time, the submittal to the Pavement Management Design Engineer shall include a separate document by the consultant certifying that the project, as designed, will be constructed entirely within the existing right-of-way. In this instance, the review period will again be ten working days. Reviewers will again be advised to return all comments to the Pavement Management Design Engineer.

Figure A-2 (continued)

### Scope Statement for Design RFP

#### 3. Contract Plans

After all final plan comments have been consolidated by the VAOT they will be forwarded to the consultant and incorporated into the project plans. Once incorporated, contract plans, cost estimate, and special provisions for features unique to the project will be forwarded to the Pavement Management Design Engineer for processing. A Mylar of the title sheet, with the firms logo and professional engineer's stamp shall be included with this submittal. In addition, the consultant will provide, on 3.5-inch diskettes, an electronic copy of all plan sheets related to the project in a format as approved by the Pavement Management Design Engineer. Successful completion of this phase will end the consultant's plan development responsibility for each project, however, if errors and/ or omissions are discovered during the contracting process it shall be the responsibility of the consultant to make corrections at no additional cost to the Agency.

#### C. Project Meetings

##### 1. Community Meetings

When directed by the Pavement Management Design Engineer, the consultant will schedule and co-chair, with the Pavement Management Design Engineer, a meeting or hearing in each town involved, at a convenient location, to discuss local issues of concern and solicit local input regarding issues that need to be considered in the development of the project. Invitees may include the following: the FHWA, when required, a Pavement Management representative, the district transportation administrator(s), officials from town(s) in which the project is located, area legislators, representative(s) from the local Regional Planning Commission, and the VAOT regional planning coordinator. The consultant shall record and distribute minutes of the meeting/hearing to all attendees.

##### 2. Resource Agency Meetings

When directed by the Pavement Management Design Engineer, the consultant shall contact the Agency of Transportation's Director of Technical Services to schedule a meeting with the Agency's archaeologist, biologist, and historic preservation program coordinator to discuss and document any related issues, concerns, procedures, and any other resource-related matters. On a less frequent basis, the consultant may be directed by the Pavement Management Design Engineer to schedule a meeting to solicit and document input from following resource agencies: Vermont Agency of Natural Resources, Vermont Division for Historic Preservation, the Act 250 Commission, the Scenery Preservation Council, the Army Corps of Engineers, and the Vermont Department of Agriculture.

#### D. Plan Development

1. Project plan sheets shall be ISO metric size A1 (594mm × 841mm), unless otherwise specified by the Pavement Management Design Engineer. Half-size prints of project plans required for submittals will be provided by the consultant. The submittal process and requirements will be discussed at the initial program design conference.
2. All project plans shall be prepared using metric dimensions and quantities. Where existing survey data is used, the dimensions as shown on the plans shall be converted to metric. Conversions/equations, as required by the Pavement Management Design Engineer, shall be provided. Each sheet in the project plans shall bear the VAOT metric symbol.

Figure A-2 (continued)

**Scope Statement for Design RFP**

3. Standard drawings and standard design details are available from the VAOT Intergraph CADD system through the VAOT Bulletin Board. If requested by the consultant, the VAOT may provide pertinent data using digital formats; otherwise the details will be provided on Mylar sheets. Digital data will be used only for VAOT projects. Files transferred to consultants may not be sold or transferred to others without written approval from the Vermont Agency of Transportation.

**IV. Phase II. Engineering services during construction.**

The consultant shall be responsible for the review and approval of shop drawings for items requiring their submission on the project.

The consultant will not be required to provide construction inspection services.

The consultant's obligation for work on this project shall terminate upon the VAOT's completion and acceptance of the project construction.

**V. Miscellaneous**

To accomplish all of the previously described tasks and material submittals, the consultant, once under contract, shall be prepared to begin work on specific assignments within one week of the project notice to proceed. Work done on these projects will be reimbursed monthly as ultimately agreed to between the consultant and the Agency.

Individual projects may require consolidation into contract groups, as directed by the Pavement Management Design Engineer. This will necessitate the preparation of composite title, index, and quantity sheets.

Based on their performance, the VAOT may assign additional work with selected consultants within the time frame of this contract.

If, during development of any project, it is determined that additional right-of-way or other delaying processes will be required, the Agency may decide to remove such project from the consultant's active list of assigned projects and seek to complete the project through other means. Additionally, if a consultant's performance is deemed unsatisfactory by the Pavement Management Design Engineer, the Agency reserves the right to remove this project from the consultant's active list and seek to complete the project through other means.

Design computations, project plans, and electronically formatted plans, as requested by the Pavement Management Design Engineer, shall be furnished to the VAOT at any time during the design phase of the above work.

All of the above work shall be accomplished to the full satisfaction of the VAOT and in conformance with all existing applicable federal, state and local laws.

G:\pavement\guide\pmscope

Note: Attachments are not included in this figure. Attachment B, with its addendums, is in Figures A-5, A-14, and A-16. Attachment D is in Figure A-21.

Figure A-3

**Scope Statement for Condition Survey RFP**

January 8, 1996

**INTRODUCTION**

The Vermont Agency of Transportation (VAOT) expects to engage the services of a consultant to perform pavement condition surveys on Vermont's Interstate, State and Class I Town Highway road systems.

This will be a single phase project in which the successful consultant will be responsible for providing the deliverables in accordance with all requirements stated in this document.

**DELIVERABLES**

1. Two copies of each year's condition survey data on electronic media, delivered annually to VAOT Pavement Management Unit.

**SCOPE OF WORK**

1. Perform pavement condition surveys on Vermont roads in the following order.
  - 1996: State Highway System (2400 +/- lane miles of testing) and Class I Town Highway System (140 +/- lane miles of testing).
  - 1997: Interstate Highway System (640 +/- lane miles of testing).
  - 1998: State Highway System (2400 +/- lane miles of testing) and Class I Town Highway System (140 +/- lane miles of testing).
  - 1999: Interstate Highway System (640 +/- lane miles of testing).
2. Survey 5 additional sites each year of the contract for the purpose of verifying roughness data. Each site will be selected by VAOT, maximum length 0.2 miles, located within a one hour drive +/- of Montpelier, VT, and must be surveyed in the direction specified by VAOT.
3. Check each year's data for accuracy, edit for completeness, and format to VAOT requirements prior to transfer of data to VAOT.

**Scope Statement for Condition Survey RFP**

**FUNCTIONAL REQUIREMENTS**

1. The pavement condition surveys shall include an inventory and evaluation of the pavement surface condition. Surface condition data will be collected for cracking, rutting, patching, and IRI roughness.
2. All data must be referenced to and integrated with Vermont’s established milemarker identification system. VAOT will supply the selected consultant with a mileage table for all roads to be tested and a list of physical features, such as intersections and bridges, located by milemarker. Physical features will be referenced to the center (middle of bridge, middle of intersections).
3. Field testing may start on May 15 and must be completed by July 30; transfer of data to VAOT must be completed by September 30 for each year of testing. Unusual weather conditions, as determined by VAOT, may delay the start of testing one or two weeks.
4. VAOT staff use proprietary Pavement Management software purchased from Deighton Associates Ltd., Bowmanville, Ontario, Canada, for data storage and analysis. All data must successfully load into the Deighton software before final payment will be made.
5. All data will be formatted in DBF format, described as follows:

NAME	T Y P E	WIDTH	DECIMAL	DESCRIPTION
RD_ELEMENT	C	11	0	Name of road
FR_OFF	N	10	3	Relative From address (miles)
TO_OFF	N	10	3	Relative To address (miles)
ELEM_ID	C	19	0	Piece element ID
IRI	N	5	2	Ride value IRI
RUT	N	3	0	Rut depth
FATIG_SEV	C	1	0	Fatigue cracking severity
FATIG_EXT	C	1	0	Fatigue cracking extent
TRANS_SEV	C	1	0	Transverse cracking severity
TRANS_EXT	C	1	0	Transverse cracking extent
PATCH_SEV	C	1	0	Patching severity
PATCH_EXT	C	1	0	Patching extent

Figure A-3 (continued)

**Scope Statement for Condition Survey RFP**

6. IRI Roughness data will be collected continuously and aggregated into 0.1 mile increments. Units will be metric (mm/m or m/km).
7. Rutting data will be collected continuously and aggregated into 0.1 mile increments. Units will be metric (mm).
8. Cracking data and Patching data will be collected in terms of severity and extent. Cracks to be identified are fatigue cracks and transverse cracks as defined by the Strategic Highway Research Program (SHRP) Distress Identification Manual for the Long-Term Pavement Performance Project. Data may be aggregated into a maximum of 0.25 mile increments.
9. Three levels of severity will be used for crack data and patch data to indicate how bad the condition is. The three levels are described in the following table:

DEFICIENCY	LOW	MEDIUM	HIGH
Transverse Cracking	< 1/4 inch width	> 1/4 inch width & < 1/4 inch depressions	> 1/4 inch width & > 1/4 inch depressions
Fatigue Cracking	Fine parallel hairline cracks	Alligator pattern clearly developed	Alligator pattern clearly developed with spalling and distortion
Patching and Patch Deterioration	Little or no defects with smooth ride	Clear signs of cracking on notable roughness	Heavy cracking or other distress with distinct roughness

10. The extent of crack data and patch data shall be recorded for the predominant level of severity and will indicate how much of the condition exists. Extent will be measured in the four general categories of length as described in the following table:

DEFICIENCY	LOW	MODERATE	HIGH	EXTREME
Transverse Cracking	> 50 ft. spacing	>25 ft. & < 50 ft. spacing	< 25 ft. spacing	N/A
Fatigue Cracking	1% to 9% of wheel path	10% to 24% of wheel path	25% to 49% of wheel path	> 50% of wheel path
Patching and Patch Deterioration	1% to 9% of wheel path	10% to 24% of wheel path	25% to 49% of wheel path	> 50% of wheel path

**Scope Statement for Condition Survey RFP**

11. Testing of the roughness verification sites by VAOT will be by Dipstick. In addition, VAOT will perform random verification on Consultant crack data. If reasonable similarities between Consultant data and VAOT verification data for roughness and cracks cannot be found, the Consultant will be required to justify the validity and accuracy of their data before final payment will be made.
12. Passing lanes, turning lanes, and truck lanes will not be tested unless specifically requested by VAOT.
13. Test lanes in road construction areas will be flagged and identified during the survey by the consultant, but will not be surveyed.
14. Bridges longer than 150 feet (50 meters) in length will be flagged and identified by the consultant, but will not be surveyed.
15. Payment each year of the contract will be based on the number of lane miles actually tested. 40% of the amount will be paid upon completion of the field testing, and the remaining 60% upon delivery and acceptance of the survey data.
16. Provisions shall be made for one VAOT employee to accompany the consultant survey crew at all times during testing. Proposers must comply with Vermont state law requiring seat belts to be worn by all occupants of the vehicle, and data must be collected in a safe manner.
17. VAOT will supply the required test directions for each highway, one pass per two-lane mile, but routing will be up to the selected consultant.
18. VAOT will have access to raw data upon request.

Figure A-4

Consultant Payment Spreadsheet

VERMONT AGENCY OF TRANSPORTATION  
PAVEMENT MANAGEMENT SECTION  
CONSULTANT TRACKING SHEET

WEBSTER-MARTIN, INC.  
1025 AIRPORT DRIVE  
P.O. BOX 2246  
SOUTH BURLINGTON, VT 05407  
(802)864-0223

CONTRACT : # 0981834  
VENDOR NO: 1100407407  
EXPIRATION: 09/30/98  
MAXIMUM LIMITING AMT: 1,000,000  
CONTRACT AMT TO DATE: 512,387  
CONTRACT BALANCE 487,413

CURRENT EST DESIGN WORK  
TOTAL COMPLETED 852,863  
REMAINING 486,222  
386,641

EST DESIGN COST / MILE  
CLASS 1: 39,247  
STATE HWY: 7,635  
INTERSTATE: 0

ACTUAL DESIGN COST / MILE  
CLASS 1: 41,468  
STATE HWY: 11,830  
INTERSTATE: 0

CURRENT EST ENVR WORK  
TOTAL COMPLETED 66,618  
REMAINING 26,366  
40,252

EST ENVR COST / MILE  
CLASS 1: 3,181  
STATE HWY: 1,347  
INTERSTATE: 0

ACTUAL ENVR COST / MILE  
CLASS 1: 0  
STATE HWY: 0  
INTERSTATE: 0

08/21/97

INVOICE NUMBER	INVOICE DATE	DATE FROM	DATE TO	DATE	TOTAL CONSULTANT BILLED	CONSULTANT AMOUNT	AGENCY AMOUNT	MADE BY	ADJUSTMENTS	AGENCY AMOUNT	RETAINED AMOUNT	PAID AMOUNT	FMS VOUCHER NUMBER	FMS ESCROW VOUCHER NUMBER	FMS ESCROW DATE	
1	07/29/95	06/18/95	07/15/95	07/15/95	3,859.01	3,859.01	203.11		0.00	3,859.01	0.00	3,859.01	026767	203.11	09/06/95	
2	08/31/95	07/16/95	08/19/95	08/19/95	18,437.07	19,407.44	970.37		0.00	14,948.78	0.00	3,488.29	049631	183.58	10/13/95	
3	09/30/95	08/20/95	09/16/95	09/16/95	3,604.01	3,759.69	185.68		0.00	2,922.12	0.00	681.38	078381	35.69	12/11/95	
4	11/25/95	09/17/95	11/11/95	11/11/95	993.80	1,046.10	52.31		0.00	805.76	0.00	188.03	095316	9.90	01/22/96	
5	12/30/95	11/12/95	12/16/95	12/16/95	4,894.83	5,152.45	257.62		0.00	926.10	0.00	905.16	110490	42.41	01/22/96	
6	01/27/96	12/17/95	01/13/96	01/13/96	363.38	344.26	18.12		0.00	3,968.73	0.00	926.10	110490	48.74	02/20/96	
7	02/24/96	01/14/96	02/10/96	02/10/96	2,085.35	1,981.08	104.27		0.00	374.82	0.00	18.12	130640	19.72	03/26/96	
8	03/30/96	02/11/96	03/16/96	03/16/96	4,352.18	4,134.57	217.61		0.00	1,608.26	0.00	782.26	130639	84.54	03/26/96	
9	04/30/96	03/17/96	04/13/96	04/13/96	4,455.97	4,455.97	0.00		0.00	3,352.31	0.00	801.45	147993	176.43	04/30/96	
10	05/31/96	04/14/96	05/18/96	05/18/96	8,500.31	8,500.31	0.00		0.00	4,236.02	0.00	4,264.29	159761	42.19	05/27/96	
11	06/29/96	05/19/96	06/15/96	06/15/96	5,188.85	5,188.85	0.00		0.00	8,075.29	0.00	4,929.41	159761	180.76	05/27/96	
12	07/27/96	06/16/96	07/13/96	07/13/96	157.88	157.88	0.00		0.00	4,929.41	0.00	157.88	172958	80.41	06/26/96	
13	03/29/97	07/14/96	03/19/97	03/19/97	11,469.81	11,469.81	0.00		0.00	6,547.45	0.00	4,922.36	172957	344.80	06/26/96	
14	04/29/97	04/13/97	05/07/97	05/07/97	19,097.72	19,097.72	0.00		0.00	4,929.41	0.00	157.88	030953	259.44	07/24/96	
15	05/31/97	04/13/97	05/17/97	05/17/97	19,097.72	19,097.72	0.00		0.00	88,021.63	0.00	55,647.21	030953	259.44	07/24/96	
PROJECT TOTAL																
											2,920.49	55,647.21			2,920.49	WEB-MAR

PROJECT NAME	PROJECT NUMBER	EA #	ROUTE	BEGIN MM	END MM	LENGTH	DESIGN ESTIMATE	PROJECT COST TO DATE	PROJECT BALANCE	PERCENT BILLED	PERCENT COMPLETE					
SWANTON	NH 9554(1)S	9554001-100	VT 78	6.345	6.746	0.403	35,000	188.17	23.83	9.90	100.00%					
PROJECT TOTAL																
											20.91	387.41	20.92	387.41	20.91	WEB-MAR



Figure A-5

**Interim Policy on Resurfacing**

Revised January 31, 1992

STATE OF VERMONT

VERMONT AGENCY OF TRANSPORTATION

Interim Policy on

- RESURFACING -

Federal Aid Non-Freeway Facilities  
and  
Roadways Not on the Principal Arterials Expected  
to be Part of the National Highway System

Consistent with federal legislation titled Intermodal Surface Transportation Efficiency Act of 1991, the resurfacing of highways is eligible for federal participation.

This policy establishes the criteria and procedures to be followed in developing resurfacing projects pending receipt of federal directives implementing the aforesaid legislation, specifically, those pertaining to surface transportation program and program efficiencies.

(1) GENERAL:

Resurfacing projects will be selected, scoped, and designed with the dual goals of:

- (a) providing a safe, durable, high quality surface and,
- (b) minimum total life-cycle analysis.

(2) PROJECT SELECTION:

- (a) The pavement management system will be used to select and prioritize roadways exhibiting the worst degree of distress. The most distressed areas will be given priority.
- (b) Resurfacing projects will not be under-

Figure A-5 (continued)

**Interim Policy on Resurfacing**

taken where there is reasonable expectation of reconstruction, significant reconstruction, relocation, or other work which will materially remove the resurfacing from service within five-years of the date it is constructed.

## (3) SCOPE:

Resurfacing projects have restoration of existing highway surfaces as the primary objective. Enhancement of highway safety is an essential consideration as well as other measures to improve traffic flow and maintainability of the facility when this related work is within existing highway rights-of-way, and acquisition of property interests is not required.

## (4) STRUCTURAL DESIGN:

- (a) Overlay thickness will be designed to provide sufficient strength to accommodate the cumulative standard axle loads (ESAL) expected over a 10-year time span.
- (b) Limited areas of subbase reconstruction may be included where required to achieve structural needs for the design life.
- (c) Stone chip seals will not be employed.
- (d) Methods which recycle or conserve raw materials or are otherwise environmentally conscious, will be used whenever appropriate.

## (5) PROJECT DESIGN:

- (a) Shoulder improvements may provide backing to the shoulder area and include bituminous concrete surface. Where there is a closed drainage system, the gutter and curb may be paved and/or rehabilitated. Drop inlet grate and manhole elevations will be adjusted as appropriate. In built-up areas, sidewalks may be resurfaced. Removing and resetting curb is not generally appropriate to resurfacing projects.
- (b) Traffic Control Improvements may provide for, but not limited to, signing,

Figure A-5 (continued)

**Interim Policy on Resurfacing**

signals, islands, pavement markings, and similar efforts. Where appropriate and timely, speciality work such as signals, signs, etc. may be done as "staged work" when not integral to the paving. Long-term effective striping and marking materials will be utilized.

- (c) Safety improvements may include work designed to improve contributing conditions at high-accident locations where acquisition of property interests is not required. High accident location is defined as having an Actual Rate to Critical Rate ratio greater than 2, and such locations will be analyzed.

Measures to improve highway safety throughout the project may be undertaken, including upgrading of guard rail, flattening slopes, removal of roadside obstructions, replacing mailbox supports, etc. where appropriate.

Rehabilitation or improvement of bridge railings or other elements other than cable bridge systems and/or approach rail is not generally appropriate to resurfacing projects. Cable systems will be replaced with steel beam systems. Blunt ends of bridge curbs will be upgraded.

- (d) In all cases, a modified design standard practice may be employed as necessary to avoid acquisition of property interest and/or time consuming permits and signoffs.
- (e) Resurfacing projects may utilize any current standard technology, product, materials, or technique appropriate. The use of demonstration or trial procedures is permitted under an evaluation (research) program where approved by the departmental director supervising the Pavement Management Program (hereafter referred to as Director).

(8) GEOMETRIC DESIGN:

Resurfacing projects are not intended nor required to improve roadway geometry,

Figure A-5 (continued)

**Interim Policy on Resurfacing**

width, design speed, super-elevation, or other features except as noted above, but may include drainage improvements where approved by the Director. Deficient super-elevation locations will have advisory speed plates.

(7) CONSTRUCTION:

- (a) Resurfacing projects will be undertaken in conformance with the latest edition of the Agency publication, Standard Specifications for Highway and Bridge Construction subject to such modifications as may be approved by the Director on a project-to-project basis.
- (b) All requirements pertaining to contracting of federal aid work will be conformed to.

APPROVED:

s/Patrick Garahan

\_\_\_\_\_  
Secretary

1/31/92

\_\_\_\_\_  
Date

Figure A-6

Testing and Investigation Spreadsheet

PROPOSED 1998 PAVING PROGRAM - STATE SYSTEM PAVING

PIN #	PROJECT NAME	PROJECT #	ROUTE #	BEGIN MM	END MM	LENGTH	EXIST S#	DESIGN S#	CORED	ESALS	FWD	RECOMM	RECOMM. TREATMENT	DESIGN TREATMENT
92D228	ESSEX-COLCHESTER	STP9477	VT2A	1.093	2.431	4.421	92#S	92#S						
96D006	WILLISTON	STP9703	VT2A	3.835	5.940	2.105			03/28/96	05/17/96	06/11/92	incomplete		
98B016	MANCHESTER-WINHALL	STP-F016-1(16)	VT11	3.051	3.283	3.482			03/29/96	05/17/96	07/02/96			
96B012	CAMBRIDGE-JOHNSON	STP9706	VT15	6.200	4.277	7.910			04/02/96	requested				
96C022	ESSEX-WESTFORD	STP9712	VT128	0.000	1.312	5.714			04/01/96	08/09/96	05/21/96			
93C113	ROCKINGHAM-SPRINGFIELD	STP9513	US5	1.492	1.928	10.781	yes		yes	03/29/96	92 & 93	10/10/96	Level + 40mm III	
96C008	BROOKFIELD-ROXBURY	STP9704	VT12	0.000	1.484	7.009			03/29/96	03/29/96	10/10/96	10/10/96	Level + 40mm III	
96B128	SOUTH HERO	STP9714	US2	0.000	3.041	3.041			yes	requested	10/10/96	10/10/96	Level + 40mm III	
95C062	BARNET	STP9624	US5	3.535	9.939	6.404			yes	requested	10/10/96	10/10/96	Level + 40mm III	
96B014	BRATTLEBORO-DUMMERSTON	STP9708	VT30	0.491	5.097	8.351				03/29/96	10/10/96	10/10/96	Level + 40mm III	
96B016	WELLS-POULTNEY	STP9709	VT30	3.643	4.193	5.647				05/17/96	10/10/96	10/10/96	Level + 40mm III	
93C106	WILLIAMSTOWN	STP9506	VT64	0.084	4.223	4.139	yes	yes	yes	03/29/96	05/19/93	10/09/96	Level + 40mm III	
89C025	BRADFORD-NEWBURY	STP-RS0113(49)	US5	3.314	1.472	5.859				requested	10/10/96	10/10/96	Level + 40mm III	
95B022	DORSET	STP9604	VT30	0.651	5.225	4.574	yes	yes	yes	08/29/95	08/24/95	10/09/96	Level + 40mm III	
96B130	POULTNEY-CASTLETON	STP9715	VT30	4.885	1.560	6.266				requested				
95B084	LUDLOW	STP9636	VT100	0.000	4.317	4.317	yes		yes	07/27/93	06/17/93			
96B132	CHARLESTON-BRIGHTON	STP9716	VT105	0.800	3.205	12.435	yes		Charleston only	requested				
93C107	WEATHERSFLO-WOODSTOCK	STP9507	VT106	4.305	6.553	17.180	yes	yes	yes	07/27/93	07/14/93	10/31/95	Level + 40mm III	
92C161	STOWE-CAMBRIDGE	STP9403	VT108	5.537	2.183	5.280				requested				
92D170	BERLIN	STP9413	US302	0.000	1.895	2.418			yes	06/04/92	*****	10/09/96	CP 50mm + 40mm III	
93B102	FLETCHER-BAKERSFIELD	STP9502	VT108	0.000	1.550	3.881	yes	yes	yes	03/29/96	06/16/93	10/09/96	Level + 40mm III	

total miles 131.214

( / = and / or )

\* Recommendation by  
Gil Newbury

Figure A-7

## **Treatment Options**

The following listing represents the primary treatments that are commonly used by the Agency. Other treatments or combinations may be used if physical conditions or test data indicate advantages in long-term network condition.

Treatments are numbered only for convenience in reference; there is no intent to indicate preference or priority.

### **1. Cold Recycled and Overlay (CROL)**

The cold-recycle process consists of milling a portion of the existing pavement depth. The milled material is mixed with a stabilizing binder of bituminous emulsion. The mixture is then placed back on the milled area, graded, and compacted. The process may occur on the roadway by use of an equipment train, or the milled material may be taken off site for rejuvenating.

The purpose of this technique is to destroy the crack patterns and restore the roadway cross section. Minor settlements (50-mm (2-in.) maximum) may be corrected by the addition of stabilized granular material during the mixing process.

The CROL technique is most useful if there is a good quality subbase and a stable subgrade.

A thin overlay (TNOL) on the recycled materials serves as a wearing course. It also reduces the likelihood of water entering the relatively porous recycled materials and being trapped above the remaining original pavement structure.

### **2. Hot In-Place Recycling (HIP)**

Hot in-place recycling is applicable under the same conditions and for the same purposes as described for cold-recycle-and-overlay. Hot in-place recycling is done on the roadway with an equipment train. The considerable amount of smoke and fumes generated by the process limits its use in urban areas.

### **3. Pulverize and Overlay (PAO)**

This technique consists of pulverizing the existing pavement and mixing it into the upper layer (approximately 100 mm (4 in.)) of the existing granular subbase material. The mixed material may have water added during the process to improve compaction. After mixing, the material is graded and compacted to form a subbase layer.

A chloride solution may be substituted for the water added during the mixing process. Improved stability of the subbase is obtained by this technique.

The roadbed structure receives a degree of improvement from the added granular material. The crack pattern is destroyed completely so performance is similar to new pavement over a subbase of crushed gravel. Roadways that are greatly deformed can be corrected by grading the mixed materials or by adding additional granular material prior to final mixing, grading, and compaction.

A structural overlay (STOL) serves as the structural pavement and wearing course.

*Figure A-7 (continued)*

## **Treatment Options**

### **4. Mill and Fill (MAF)**

Mill-and-fill consists of milling 50 to 80 mm (2 to 3 in.) of existing pavement and replacing it with two lifts of bituminous concrete.

This technique is relatively costly and ordinarily is used only if necessary to preserve or restore curb reveal. It may be used on the driving lanes if paved shoulder areas do not require rehabilitation.

In locations where previous resurfacing has resulted in little or no curb reveal or excessive crown, milling depth is increased.

### **5. Structural Overlay (STOL)**

This technique consists of adding lifts of bituminous concrete to the existing flexible pavement, as necessary to provide the designed pavement thickness. The overlay may be preceded by a full or partial leveling course to take out surface irregularities, depending on the amount of deformation present.

Overlays provide added strength to the pavement structure, but they are susceptible to the onset of reflective cracking along the course of cracks in the underlying pavement.

A structural overlay is best used if investigation indicates added pavement structure is needed and before the severity and extent of cracking are rated as high.

### **6. Level and Overlay (LVOL)**

Level-and-overlay consists of applying a bituminous concrete leveling course to bring the low areas in the roadway surface up to normal cross section and to provide minimal cover over the higher points. The leveling may cover one-half of a roadway or its entire width. The overlay is normally one 35 mm ( $1\frac{1}{4}$  in.) thick course of bituminous concrete over the entire roadway.

### **7. Thin Overlay (TNOL)**

This technique consists of placing one course of bituminous material. Usually the material is 20 mm ( $\frac{3}{4}$  in.) deep over the highest area of the roadway cross section. Leveling occurs to a limited degree.

This is ordinarily a technique for preventive maintenance. It is applicable when the roadway has good cross-section, but the surface is weathered, and considerable crackfilling or patching of pot holes is necessary.

A high-order variation of this technique uses a coarse-graded, high-percentage asphalt mixture, 20 mm ( $\frac{3}{4}$  in.) deep, as the wearing course. The technique results in significantly reduced water spray from tires and a much quieter ride. It is primarily for freeway-type highways. The open-graded friction course has demonstrated exceptionally long life.

*Figure A-7 (continued)*

### **Treatment Options**

#### **8. Spot leveling (SL)**

Spot leveling provides improved contact for snow plows and fills depressions that pond water. It consists of placing bituminous material as required to restore the roadway cross section or to bring the area of pavement to grade where settlement has occurred.

#### **9. Chip Seal (CS)**

Chip seal consists of preparing the surface by patching potholes and leveling depressions. A cold asphalt emulsion is applied to the surface. Crushed stone, 10 mm ( $\frac{3}{8}$  in.) in size, is then quickly and uniformly spread one stone deep on the liquid. Traffic is not allowed on the roadway until the emulsion has “broken.” Brooming any loose stone off the surface is usually necessary after the emulsion has set up.

#### **10. Slurry Seal (SS)**

Slurry seal consists of applying a premixed solution of emulsified asphalt with mineral filler on the roadway surface. The treatment seals minor cracks and stabilizes the surface of aged pavements. It is useful only on roadways in good structural condition, without severe cracking.

#### **11. Microsurfacing (MS)**

Microsurfacing consists of spreading a polymerized liquid asphalt-aggregate mixture in the rutted areas of a roadway. The treatment was developed to correct extended rutting that causes hydroplaning. It is applicable only to roadways in good structural condition. It may be applied on the entire roadway surface as a seal coat.

#### **12. Crack-Filling (CF)**

Crack-filling is a preventive maintenance activity that consists of cleaning and firming the edges of cracks in the pavement, followed by application of a hot-poured rubberized asphalt joint material. Either a router or a hot-air lance is used for cleaning and firming. Following cleaning, a high pressure air jet removes dust and loose particles from the cracks. Apply the joint material with a wide-banding technique. In wide banding, the hot-poured material fills the crack, and minimal excess material is left on the roadway surface on both sides of the crack. The total width of material on the surface is approximately 75 mm (3 in.).

Crack-filling is applicable to thermal cracks and construction defects, generally in the third year after paving. The expected benefit is delayed pothole formation at the crack location.

Structural cracks, due to settlement or slipping within the subgrade, and fatigue cracks are occasionally filled. Little benefit is usually observed in regard to pavement life, but frost heaves can be reduced.



Figure A-8

**Advisory Letter to Towns**



STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
133 State Street, Administration Building  
Montpelier, Vermont 05633-5001



September 11, 1996

Betty A. Wheeler, Town Manager  
Town of Middlebury  
Municipal Building  
Middlebury, VT 05753  
RE: Middlebury NH 9628

Dear Town Manager:

The Vermont Agency of Transportation has identified the need for repaving and /or rehabilitation of the pavement surface on U. S. 7 in your Town. A project known as Middlebury NH 9628 has been established with a starting point at approximately MM 5.713 and ending with MM 6.426 (see attached map). In addition to the paving work, guardrail will be upgraded as necessary along with pavement markings and limited signing.

The design of this project is just in the preliminary stages at this time and it is anticipated that the job will be let to contract within the next couple of years depending on funding availability.

Should you have any questions or concerns regarding the work to be accomplished, please do not hesitate to contact this office at (802) 828-2973.

Sincerely,

A handwritten signature in cursive script that reads "Wm. Michael Hedges".

Wm. Michael Hedges, P.E.  
Pavement Management Engineer

WMH/APC/ls

Attachment

c: DTA #5, Dick Hosking  
Regional Planning Director, Sandi Young  
Regional Planning Coordinator, Clay Poitras  
Design file

Telecommunications Relay Service 1-800-253-0191

Vermont is an Equal Opportunity Employer.

Figure A-9  
Final Project List

PROPOSED SUMMER 1997 PAVING PROGRAM DRAFT

07/08/97

ROUTE	1997 TOWN(S)	PROJECT NUMBER	DIST	BEGIN MM	END MM	LENGTH (MILES)
<b>PREVENTIVE MAINTENANCE</b>						
STATEWIDE						
<b>CLASS 1 PROJECTS</b>						
FSH	VERGENNES	STP 9650		0.000	0.663	0.663
US 4	HARTFORD(WRJ)	STP 9656		9.354	9.591	0.237
US 5	BRATTLEBORO	STP 9643		1.092	2.990	1.898
US5	NEWPORT	STP 9651		1.505	3.880	2.375
US 7	BRANDON	NH 9619		3.800	4.250	0.450
US 7	RUTLAND CITY (4 lane)	NH 9609		0.629	1.287	1.316
VT 15	ESSEX JUNCTION	STP 9664		2.249	3.259	1.010
VT 100	READSBORO	STP 9658		6.547	7.076	0.529
VT 116	BRISTOL	STP 9653		6.025	7.250	1.225
VT 22A	VERGENNES	STP 9649		0.999	1.920	0.921
VT139	RICHFORD	STP 9663		0.000	1.822	1.822
						12.446
<b>STATE SYSTEM PROJECTS</b>						
BERLSH	BERLIN (+ One-way)	STP 9515	6	1.852	2.280	0.882
VT 62	BERLIN (4 lane)	STP 9666	6	0.000	1.382	2.763
US 2	CABOT-DANVILLE	NH 9660	7	5.279	1.735	2.673
US5	BARTON	STP 9713	9	0.000	3.883	3.883
US 5	LYNDON (V)	STP 9211	7	1.865	2.638	0.773
US 7	MILTON-GEORGIA	STP 9501	8	5.137	1.103	3.796
US 7	MIDDLEBURY	NH 9628	5	5.713	6.426	0.749
VT12A	RANDOLPH-BRAINTREE	STP 9630	4	0.398	5.187	6.064
VT 12A	NORTHFIELD	STP 9462	6	1.884	4.075	2.191
VT14	COVENTRY	STP 9705	9	0.112	3.700	3.588
VT 14	BARRE TOWN - E MONTP	STP 9452	6	2.319	0.114	1.828
VT22A	BENSON	STP 9635	3	0.806	6.276	5.470
VT 22A	ORWELL	STP 9633	3	0.000	3.241	3.241
VT 22A	WEST HAVEN-BENSON	STP 9634	3	1.348	0.806	2.465
VT 30	JAMAICA-WINHALL	STP 9519	2	3.325	2.096	8.900
VT 30	MANCHESTER-DORSET	STP 9603	1	0.160	0.272	2.897
VT58	BARTON	STP 9401	9	0.739	3.693	2.954
VT100	STAMFORD-READSBORO	STP 9711	1	0.000	2.193	7.945
VT100	GRANVILLE-WARREN	STP 9710	4/6	2.971	3.000	9.716
VT 104A	GEORGIA-FAIRFAX	STP 9511	8	0.000	1.165	4.527
VT 105	ENOSBURG-BERKSHIRE	STP 9505	8	1.501	3.700	7.366
VT 105	RICHFORD	STP 9510	8	0.000	1.547	1.547
VT 106	SPRINGFIELD-WEATHFLD	STP 9461	2	3.283	2.347	2.862
VT110	CHELSEA	STP-RS0169(7)	4	2.787	3.335	0.548
VT114	LYNDON-EAST HAVEN	STP-RS0269(9)	7	0.000	1.650	10.728
VT 131	WEATHERSFIELD	STP 9475	2	1.322	7.965	6.643
VT 314	SOUTH HERO-GRAND ISLE	STP 9573	8	0.000	0.710	2.317
						109.316
<b>INTERSTATE PROJECTS</b>						
I91	SHEFFIELD-BARTON	IM 091-3( )	SB	150.700	156.000	5.300
I89	GEORGIA-FAIRFAX	IM IR089-3( ) C	NB/SB	106.900	111.000	8.200
I89	COLCHESTER	IM 089-3(29)	NB/SB	91.880	98.000	12.240
						25.740
<b>PROGRAM TOTAL</b>						<b>147.502</b>

Figure A-10  
Form PAR/DB

Vermont Agency of Transportation

To: Programming Engineer

<b>PROGRAM ACTION REQUEST</b>		From:									
		Project Engr:									
		Date:									
Rd/Rt or Local Name	County Name	Town/City or Study Area									
Project Location (termini)		(Note: Location map must be attached)									
Project Length _____ mi.											
General description of Road Work:											
(Please indicate road work characteristics on back of PAR)		<table border="1" style="border-collapse: collapse;"> <tr> <td style="width:5%; text-align: center;">A</td> <td style="width:45%; text-align: center;">Present Year</td> <td style="width:50%; text-align: center;">Future Year</td> </tr> <tr> <td style="text-align: center;">D</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">T</td> <td></td> <td></td> </tr> </table>	A	Present Year	Future Year	D			T		
A	Present Year	Future Year									
D											
T											

NATURE OF REQUEST: (Check appropriate boxes)

METRIC?

- NEW PROJECT-Project is to be in the approved Capital Construction Program.
- Fund as a STATE project only.
- Fund as a FEDERAL participating project.
- Revise PPMS project characteristics as indicated on back.
- Revise obligation/letting dates to PPMS PIN indicated below.
- Revise engineer's cost estimate to PPMS PIN indicated below.
- SEE REMARKS

OBLIGATION SCHEDULE AND ENGINEER'S COST ESTIMATE				
WORK PHASE	Oblig. Date mo/yr	Let Date mo/yr	Engr's cost est. (\$1000)	PPMS PIN
PE (Dept)		N/A		
PE (Consultant)				
Right-of-Way				
Construction				
Other:				
NOTE: Please breakdown PE cost between VAOT and Consultant				

<b>Programming Mgmt. use only</b>	
PPMS PIN's entered	_/_/_
PPMS PIN's revised	_/_/_
Char's entered	_/_/_
Entered by _____	(Int.)

REMARKS: SEE ATTACHMENTS DATED \_\_\_\_\_

AUTHORIZED \_\_\_\_\_  
PROGRAM MANAGER DATE

Figure A-10 (continued)  
Form PAR/DB

PPMS PROJECT CHARACTERISTICS

<b>MAJOR TYPE OF WORK</b>		<input type="checkbox"/> NEW LOCATION CONSTRUCTION	<input type="checkbox"/> RECONSTRUCTION-ROADWAY/BRIDGE
		<input type="checkbox"/> REHABILITATION-ROADWAY/BRIDGE	<input type="checkbox"/> RESURFACING PROJECT
		<input type="checkbox"/> INTERSTATE SAFETY PROJECT	<input type="checkbox"/> TRANS. SYSTEM MANAGEMENT
		<input type="checkbox"/> AIRPORT PROJECT	<input type="checkbox"/> AIRPORT ROW ACQUIS. PROJECT
		<input type="checkbox"/> RAILROAD PROJECT	<input type="checkbox"/> RAILROAD PURCHASING PROJECT
		<input type="checkbox"/> SPECIAL PROJECT	
<b>GENERAL</b>			
<input type="checkbox"/> Fed. Process Required	<input type="checkbox"/> Consultant Coord.	<input type="checkbox"/> Prelim Alignment Evaluation	_____ Staged Construction
<input type="checkbox"/> Survey Required	<input type="checkbox"/> State Force Account	<input type="checkbox"/> Hydraulics Required	_____ Lead Division
<input type="checkbox"/> R.O.W. Required	<input type="checkbox"/> Utility Relocation	<input type="checkbox"/> Finance/ Maint. Agrmnt Req'd	(1=RD, 2=ST, 3=TS, 4=MT, 5=RA, 6=PM, 7=CM, 8=SP)
<input type="checkbox"/> Consultant Design	<input type="checkbox"/> Stream Work Required		<input type="checkbox"/> VICS Required
<b>-Documentation-</b>		<b>-Permits-</b>	
<input type="checkbox"/> Catagorical Exclusion		<input type="checkbox"/> Stream Alteration	<input type="checkbox"/> C.O.E. 404 Nationwide
<input type="checkbox"/> E. A. <input type="checkbox"/> Final E. A.		<input type="checkbox"/> Stormwater Discharge	<input type="checkbox"/> C.O.E 404 Individual
<input type="checkbox"/> E. I. S. <input type="checkbox"/> Final E. I. S.		<input type="checkbox"/> ACT 250	<input type="checkbox"/> C.O.E. 404 General
___ Number of Section 4F Evaluations		<input type="checkbox"/> Lakes and Ponds	<input type="checkbox"/> Coast Guard
___ Number of Section 6F Evaluations			<input type="checkbox"/> Rail/Air
<b>-Hearings-</b>		<b>-Studies-</b>	
<input type="checkbox"/> Corridor		___ Archaeology Level	<input type="checkbox"/> Wetland Impact
<input type="checkbox"/> Design (502)		<input type="checkbox"/> Agricultural Land	<input type="checkbox"/> Conditional Use Determination (CUD)
<input type="checkbox"/> Combined		<input type="checkbox"/> Noise Impact	<input type="checkbox"/> Endangered Species
		___ No. Of Historical Properties	
<b>ROADWAY FUNCTIONAL CLASS INFORMATION</b>		<input type="checkbox"/> Freeway	<input type="checkbox"/> Arterial
		<input type="checkbox"/> Collector	<input type="checkbox"/> Local
<b>PROJECT AREA DESCRIPTION</b>			
<b>-Survey Difficulty-</b>		<input type="checkbox"/> Roadway Borings Required	No. Of Constructed Detours
Moderate    _____ . _____ mi		<input type="checkbox"/> Roadway over roadway	Number of Lanes
High    _____ . _____ mi		<input type="checkbox"/> Roadway under roadway	Number of Intersections
Rural Area Length    _____ . _____ mi		<input type="checkbox"/> Roadway over railroad	Number of Interchanges
Suburban Area Length    _____ . _____ mi		<input type="checkbox"/> Roadway under railroad	
Urban Area Length    _____ . _____ mi		<input type="checkbox"/> Wetlands Affected	
Mainline Length    _____ . _____ mi			
Roadway Sidelines    _____ . _____ mi			
Total New Lane miles    _____ . _____ mi		Bicycle Path    _____ . _____ mi	
<b>REMARKS:</b>			

Figure A-10 (continued)

Form PAR/DB

PPMS PROJECT CHARACTERISTICS

<b>STRUCTURES</b>			
-Description-			
<input type="checkbox"/> Bridge - Curved Girder	_____	Number of spans	
<input type="checkbox"/> Utilities on Structure	_____	Number of Bridge Sites	Bridge Roadway Width _____ Ft
<input type="checkbox"/> Single Bridge	_____	Number of temporary Bridge Sites	
<input type="checkbox"/> Dual Bridge	_____	Bridge - Skew (Degrees)	
<input type="checkbox"/> Twin Bridges	_____	Number of Buried Structures	
<input type="checkbox"/> Bridge - Horizontal Curve			
_____ Structures Borings Req'd	Bridge Length _____	Ft	
<input type="checkbox"/> Alternate Design	Buried Structure Length _____	Ft	
<input type="checkbox"/> Bridge Rail Underpass	Longest Span Length _____	Ft	
	Retaining Wall Length _____	Ft	
			<b>-Bridge Estimate-</b>
			Preliminary Engineering \$ _____
			Right-of-way _____
			Construction _____
			TOTAL \$ _____
<b>RIGHT-OF-WAY</b>			
<input type="checkbox"/> Consultant Appraisal	<input type="checkbox"/> ROW/Town Agreement Required	_____	Number of ROW Parcels
<input type="checkbox"/> Necessity Hearing Required	<input type="checkbox"/> Compensation Hearing Required	_____	Number of ROW Displacements /Functional Replacements
<b>HYDRAULICS</b>			
	_____	Number of Closed Drainage Systems	_____
_____ Scour Studies			Number of Culverts (GT 6 FT)
<input type="checkbox"/> Flood Plain Delineation		<b>-Number of Stream Crossings-</b>	_____
	_____	Minor	_____
	_____	Major	_____
			Number of Improved Inlets
			Number of Energy Dissipators
			Number of Major Ditch Designs
<b>TRAFFIC AND SAFETY</b>			
Street Lighting Length _____	mi	_____	Number of Street Lighting Sites
		_____	Number of Signalized Intersections
<b>RAILROAD AND AIRPORT PROJECTS</b>			
<input type="checkbox"/> Railroad Grade Crossing	Railway Length _____	Ft	Runway /Taxiway Length _____
			Ft
<b>PROJECT REMARKS:</b> (Special: Master Plans, E.I.S only, RAPT purchases, Statewide, Planning (HPR), etc.)			

Figure A-11

**Class 1 Finance and Maintenance Agreement**

MAINTENANCE AGREEMENT  
FOR  
CLASS I TOWN HIGHWAY PROJECT  
RICHFORD STP 9663  
EA/SUBJOB 9663001/300

This AGREEMENT, made this 5 day of December, 1996, by and between the STATE of Vermont, represented by its Agency of Transportation, hereinafter referred to as the STATE, and the Village of Richford, by its Legislative Body, hereinafter referred to as the MUNICIPALITY.

**WITNESSED:**

WHEREAS, the said STATE proposes to submit to the Federal Highway Administration, United States Department of Transportation, for approval, a Class I Town Highway, Federal-Aid project known as Richford STP 9663, which will provide certain improvements to a highway of said MUNICIPALITY as shown on the plans for this project, as provided to said MUNICIPALITY, and further described as follows:

Located in the County of Franklin, Village of Richford on Vermont Route 139, beginning at MM 0.000 and extending 1.001 miles to MM 1.001.

The project shall consist of cold planing, resurfacing of the existing highway with a leveling course, wearing course, new pavement markings, and incidental items.

NOW, THEREFORE, in consideration of the above and the mutual covenants and premises hereinafter stated,

**THE MUNICIPALITY AGREES:**

1. That such work shall be done by contract under the supervision of the STATE or its duly authorized representative.
2. To cooperate with the STATE in carrying out this work and further to render such assistance during construction as the STATE may request in the maintenance of traffic or detours or both.
3. All real estate within the right-of-way boundaries of the project shall be devoted exclusively to public highway purposes and kept free and clear of all encroachments, except as permitted by the regulations of the Federal Highway Administration, Title 23, Code of Federal Regulations, Sections 1.23 and 712.203(b). Any existing encroachments shall be removed by the MUNICIPALITY as required by the STATE but in no event later than the date of final inspection of the project.

**Class 1 Finance and Maintenance Agreement**

AGREEMENT FOR RICHFORD STP 9663

PAGE 2

- 4.A. To cooperate with the STATE and utility companies not owned by the MUNICIPALITY in the timely relocation of their facilities which are in conflict with the proposed project.
- 4.B. To cooperate with the STATE and take such steps as may be necessary to accomplish the relocation of all MUNICIPALLY owned utility facilities which are in conflict with the proposed project. Any approved cost sharing shall be as stipulated in the Utility Agreement between the MUNICIPALITY and the STATE.

The cost of utility relocation work accomplished by the Contractor for the MUNICIPALITY and designated as "non-participating", shall be the responsibility of the MUNICIPALITY. The STATE may bill the MUNICIPALITY on a monthly basis as work is completed, and the MUNICIPALITY shall reimburse the STATE in full within thirty (30) days of receipt of said bill.

- 5. It shall not permit, now or hereafter, any utilities or work on rights-of-way now controlled and/or acquired in connection with this project until detailed plans showing the proposed work have been approved by the Legislative Body. Utility facilities may be allowed with the MUNICIPALITY's permission and when located in conformance with the current Utility Accommodation Policy of the Vermont Agency of Transportation. This permit shall be in accordance with Title 19, V. S. A., Section 1111.
- 6.A. That any and all signs (including parking regulatory signs), street lights, traffic signals and pavement markings shall be installed by the Contractor as shown on the plans and maintained in place thereafter by the MUNICIPALITY at no cost to the STATE, in conformance with the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD). Once constructed, no changes shall be made to the parking and/or traffic control features without prior approval of the STATE and the Federal Highway Administration.
- 6.B. To be responsible for any cost for the relocation or adjustment of parking meters.
- 7. That if the construction of this project is suspended for the winter season, the MUNICIPALITY shall maintain the roadways in conformance with the provisions of the latest edition of the "STANDARD SPECIFICATIONS FOR CONSTRUCTION", until construction operations are resumed in the spring.
- 8. That the improvement shall be constructed as the STATE shall determine and shall be in conformance with the latest edition of the State of Vermont, Agency of Transportation "STANDARD SPECIFICATIONS FOR CONSTRUCTION", and the special provisions included in the Proposal Form and Contract Agreement for this project except as herein provided.

Figure A-11 (continued)

**Class 1 Finance and Maintenance Agreement**

AGREEMENT FOR RICHFORD STP 9663

PAGE 3

9. To diligently defend, in consultation with the STATE, all suits, actions or claims for damages sustained by abutting or adjacent property owners or occupants due to improvement, widening or relocation of right-of-way. Any payments for settlements approved by the STATE or judgments entered by courts of competent jurisdiction, will be considered by the STATE for participation as part of the overall project costs.
10. That the handling, treatment and disposal of petroleum contaminated soils and/or other hazardous material contamination in existence prior to construction shall be non-participating. Any costs associated therewith shall be the sole responsibility of the MUNICIPALITY.
11. That the Legislative Body of the Village of Richford, for themselves and their successors in office agree if such project is approved, constructed and accepted by the STATE, represented by the Agency of Transportation, to maintain the project in a manner satisfactory to the Agency of Transportation or its authorized representatives, and shall make ample provisions each year for such maintenance. In this connection, attention is invited to Title 19, V.S.A., Sections 304 and 310, listing the duties and responsibilities of the Legislative Body.

Further, to comply with the requirements of any permits issued which require maintenance and/or reporting activities after completion of construction.

**THE STATE AGREES:**

1. That all costs of this improvement other than non-participating items shall be paid with one hundred percent (100%) STATE and/or Federal funds.
2. To perform necessary liaison and negotiation with utility companies to effect the relocation of all interfering utilities not owned by the MUNICIPALITY.
3. To pay for all engineering costs incurred in the design and construction of this project.
4. To assist the MUNICIPALITY in the acquisition of any necessary rights and/or rights-of-way for the satisfactory completion of this project. All acquisitions must be in compliance with the Federal Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended in 1987 (The Uniform Act).



Figure A-12

**Design Recommendation**

LABRPT

Vermont Agency of Transportation  
Pavement Management Section

Individual Project Recommendation

ID Number: P940019

District: 5

Report Date: 12/03/96

Date Received: 03/20/92

Project Name/Number: ESSEX-COLCHESTER STP 9477

Route Number: VT2A Milemark Begin: 1.093 End: 2.431 Length: 4.421

Lowest Tested Subgrade Mod: 3595 Highest Tested Subgrade Mod: 6389

Lowest Existing S.N.: 3.01 Highest Existing S.N.: 4.08

Daily ESAL: 554 Design Life: 10 Design S.N.: 5.

S.N. Deficiency: 1.47 Core Depth: 6-8.5in

Recycling: N P.C.C. Under: N Priority:

Step III: Step V:

**Structural Recommendation:**

STRUCTURALLY DEFICIENT. OVERLAY 50mm TYPE II + 40mm TYPE III. EXCLUDE RECENTLY CONSTRUCTED SECTION OF VT2A-ACCESS TO VT289, APPROX. MM 2.4 TO MM 2.82. REPAIR DURABLE MARKINGS IN THIS AREA. IN COLCHESTER VILLAGE, APPROX. MM 1.2 TO END OF PROJECT COLD PLANE 50mm, LEVEL + 40mm TYPE III.

**Final Recommendation:**

**Comments:**

PG 58-34, 75 BLOW MARSHALL MIX.

Reviewed By: PAVEMENT MANAGEMENT PROGRAM ENGINEER

\_\_\_\_\_  
Init

CC: FILE  
DESIGN ENGINEER

Figure A-13  
Pavement Management Project Information Spreadsheet

**DRAFT**

1998 PAVEMENT MANAGEMENT PROJECT INFORMATION

PROJECT NAME	PROJECT NUMBER	ROUTE	BEGIN MM	END MM	LENGTH (MILES)	RIDE SPEC.	PG GRADE	QC/QA	MIX DESIGN SP,50,75,Conc. I,Is,II,III,III,etc.	MIX TYPE	METRIC TONNAGE	PLANS	TREAT-MENT
<b>CLASS 1 PROJECTS</b>													
BARRE CITY	STP 9741	US302	1.694	2.20	0.506		58-34			75			
NEWPORT	STP 9701	US5	0.000	0.885	0.885		64-34			75			
CASTLETON	STP 9647	VT4A	2.762	3.868	1.096		64-28			75			
CHESTER	STP 9659	VT11	4.373	5.114	0.741		64-28			75			
ISLAND POND	STP 9655	VT105	3.205	4.494	1.289		64-34			75			
NEWPORT	STP 9652	VT105	0.000	1.387	1.387		64-34			75			
ISLAND POND	STP 9654	VT114	4.472	4.892	0.420		64-34			75			
N.BENNINGTON	STP9646	VT67A	2.157	3.348	1.191		64-28			75			
					7.515								
<b>STATE SYSTEM PROJECTS</b>													
SOUTH HERO	STP 9714	US2	0.000	3.041	3.041		58-28			75			OL35
ROCKINGHAM-SPRINGFIELD	STP 9513	US5	1.492	1.928	0.781		58-28	YES		50			OL35
BARNET-ST. JOHNSBURY	STP 9624	US5	3.535	1.321	8.816		58-34	YES		50	IV,III		OL35
BRADFORD-NEWBURY	STP-RS0113(49)	US5	3.028	1.472	4.303		58-34	YES		50	IV,III		OL35
BERLIN (0.5 mi 4 lane)	STP 9413	US 302	0.000	1.895	2.418		58-34			75			OL35
ESSEX-COLCHESTER	STP 9477	VT2A	1.093	2.431	4.421	YES	64-28		SP	IV,III,II			OL50+40
WILLISTON	STP 9703	VT2A	3.835	5.940	2.105		58-28			75			OL35
MANCHESTER-WINHALL	STP-F016-1(16)	VT11	3.051	3.283	3.482		58-28			75	III		CIP+50
BROOKFIELD-ROXBURY	STP 9704	VT12	0.000	1.484	7.009		58-34	YES		50	IV,III		OL35
ESSEX-UNDERHILL	STP 9469	VT 15	5.750	4.351	10.524	YES	58-28		SP	IV,III,II			REC+60+40
CAMBRIDGE-JOHNSON	STP 9706	VT15	6.200	4.277	7.910	YES	58-34		SP	II,III,			CIP50+40
BRATTLEBORO-DUMMERSTON	STP 9708	VT30	0.491	5.097	8.351		58-28	YES		75			OL35
DORSET	STP 9604	VT30	0.272	5.225	4.953		58-28	YES		75			OL35
WELLS-POULTNEY	STP 9709	VT30	3.643	4.193	5.647		58-28	YES		50	IV,III		OL35
POULTNEY-CASTLETON	STP 9715	VT30	4.885	1.560	6.266		58-28	YES		50			OL35
WILLIAMSTOWN	STP 9506	VT64	0.084	4.223	4.139		58-34	YES		50			OL35
WESTON-LUDLOW	STP 9636	VT100	6.550	4.317	6.374		58-34	YES		50			OL35
CHARLESTON-BRIGHTON	STP 9716	VT105	0.800	3.205	12.435		58-34	YES		75	IV,III		OL35
WEATHERSFELD-WOODSTOCK	STP 9507	VT 106	4.305	6.553	17.180		58-28	YES		50	IV,III		OL35
FLETCHER-BAKERSFIELD	STP 9502	VT108	0.000	1.550	3.881		58-34	YES		50			OL35
STOWE-CAMBRIDGE	STP 9403	VT108	5.537	2.183	5.280		58-34	YES		50	IV,III		OL35
ESSEX-WESTFORD	STP 9712	VT128	0.000	1.312	5.714		58-28	YES		50	IV,III		OL35
					145.03								
<b>INTERSTATE PROJECTS</b>													
BROOKFIELD-MONTEPELLIER	IM 089-1(16)		37.77	53.088	15.318		58-34		SP	IV,III			2,050,000
NORWICH-BRADFORD		I91 SB	76.510	98.430	21.920		58-34		SP	IV,III?			
					37.238								
					189.783								

Figure A-14

### **STP Paving Projects—Design Objectives**

#### STP PAVING PROJECTS - DESIGN OBJECTIVES

The following design objectives will be used on STP paving projects if feasible and if the work can be accomplished within our existing right-of-way:

1. Pave existing travel lanes and shoulders and back all shoulders with aggregate material or topsoil.
2. Evaluate high-accident locations (w/ ratios > 2.0) and improve conditions if feasible.
3. Provide for durable pavement markings on the finished pavement course. Locate letter in word markings and special markings with respect to current practice, MUTCD, or to improve visibility; associated signs will be relocated or new signs installed.
4. Replace existing cable guard rail with steel beam guard rail with steel posts.
5. Replace runs of guide posts with delineators or guard rail.
6. Replace wood or steel marker posts with a delineator post (without reflector unit).
7. Upgrade bridge rail and approach rail to steel beam conforming to post spacing, height, and offset block requirements. Also taper bridge curb ends where required.
8. Adjust the height of existing steel beam guard rail if required.
9. Install guard rail where a year around water hazard exists (depth > 2').
10. Retrofit throat drop inlets with frames and grates and change elevation or rehabilitate DIs.
11. Limited drainage improvements where field review indicates that poor drainage is the cause of pavement and/or roadbed distress.

Figure A-14 (continued)

**STP Paving Projects—Design Objectives**

12. Total replacement of all project signing, including travel information signs (to be done under separate contract).
13. Post curves with advisory speed signs (to be done under separate contract).
14. Limited subbase correction or improvement where failure is evidenced by poor subgrade support or differential frost heaves.
15. If the project involves sidewalk reconstruction, requirements of the Americans Disabilities Act will be followed.

The following objectives will NOT be used on STP paving projects unless the work is associated with a high accident location (w/ ratios > 2.0) and, in that case, only if feasible and within our right-of-way.

1. Ledge and tree removal.
2. Replacement of drive pipes or flatten drive slopes.
3. Replacement or extension of cross pipes and major ditching.
4. Any bridge work, including deck repair, except for that work associated with upgrading the bridge rail and tapering curb ends.
6. Relocation of utility poles.
7. Installation of mailboxes.
8. Reconfiguration of intersections.

APPROVED:

\_\_\_\_\_  
Director

\_\_\_\_\_  
Date

Figure A-15

**Draft Policy on Shoulder Paving**

DRAFT

POLICY ON

SHOULDER PAVING

- ^ All State Highways will have paved shoulders unless the costs to do so become prohibitive.
  
- ^ When paving 2 or more layers, the top 2 layers should extend to the edge of the shoulder.
  
- ^ Base pavement layers should extend 1 foot beyond the edge of travelway. Where the designer deems necessary, the base should extend to the curb or 6" beyond the edge of shoulder. Following are locations the designer should consider:
  - ^ Sharp curves.
  - ^ Steep grades.
  - ^ Intersections.
  - ^ Future travel lanes.
  - ^ Commercial drives.

Figure A-16

### **Guidelines for Bridges on STP Projects**

#### **A. CURB END TREATMENT**

All blunt ends of bridge curb not behind Bridge Rail must be flared back as shown on Detail Sheet 6. Minimum length of flare shall be 6' (six feet) for concrete curb or to the first joint in granite bridge curb. Existing granite curbing will not be replaced. Blunt curb ends will not have to be flared back if they are behind Bridge Rail.

#### **B. COLD PLANING**

If a bridge is designated to be cold planed and repaved, the depth of Cold Planing and new pavement will be 1 1/4" regardless of the depth of wearing course being applied to the roadway.

#### **C. JOINT SEALER HOT Poured (COLD Poured)**

Joint sealer will only be used at the expansion end of spans in excess of 30' (thirty feet). The quantity to be used will be the lineal feet of joint sealer required, and the option to use Hot Poured or Cold Poured must be shown in the estimate and on the quantity sheet.

#### **D. BRIDGE RAIL**

Existing bridge rail of the following type shall be replaced or upgraded as indicated for the type of rail:

##### **1. 2 (or 3) cable Bridge Rail**

Existing cable rail will be removed and replaced with Heavy Duty Steel Beam Bridge Rail as indicated.

a. Top of rail will be set to 30" (2'6") above top of pavement.

b. Offset blocks will be used as long as a minimum roadway width of 18 feet is maintained.

1. 6" x 8" Pressure treated wood offset blocks will be used for concrete posts.

2. Steel offset blocks will be used for steel posts.

##### **c. POST SPACING**

1. existing post spacing equal to or less than 6'3", a single heavy duty steel beam (10 ga) rail will be used.

2. Existing post spacing greater than 6'3" and less than 10'0", 2 Heavy Duty Steel Beam (10 ga) panels will be nested one inside the other.

3. For post spacing greater than 10'0", new railing type will be determined on an individual basis by VAOT personnel.

4. Approach railing shall be Schedule I or II as required. (See Detail Sheet 1.)

Figure A-16 (continued)

**Guidelines for Bridges on STP Projects**

2. STEEL BEAM (W BEAM) BRIDGE RAIL  
Existing Steel Beam Bridge Rail will be upgraded to the following requirements.
  - a. All bridge rail must be Heavy Duty (10 ga) Steel Beam.
  - b. Top of rail between 27 and 31 inches above the top of new pavement will not require height adjustment.
  - c. Offset blocks will be used as long as a minimum roadway width of 18 feet is maintained.
    1. 6" x 8" Pressure treated wood offset blocks will be used for concrete posts.
    2. Steel offset blocks will be used for steel posts.
  - d. POST SPACING
    1. Existing post spacing equal or less than 6'3", a single Heavy Duty Steel Beam (10 ga) rail will be used.
    2. Existing post spacing greater than 6'3" and less than 10'0", 2 Heavy Duty Steel Beam (10 ga) panels will be nested one inside the other.
    3. For post spacing greater than 10'0", new railing type will be determined on an individual basis by VAOT personnel.
    4. Approach railing shall be Schedule I or Schedule II as required. (See Detail Sheet 1.)
3. SOLID CONCRETE BRIDGE RAIL  
This type of rail is acceptable. Curb ends may require flaring. Approach Railing must conform to Terminal Connector for Steel Beam Guard Rail. (See Detail Sheet 16.)
4. 2 OR 3 RAIL ALUMINUM BRIDGE RAIL (TEARDROP)  
This type of rail is acceptable if 2 Rail Aluminum Approach Rail is used.
5. 3 RAIL ALUMINUM BRIDGE RAIL (ROUND)  
This type of rail is acceptable in certain instances. Modifications to this type of rail will be made on an individual basis by VAOT personnel.
6. GALVANIZED BOX BEAM-2 RAIL  
This type of rail is acceptable with no modifications required.

Figure A-16 (continued)

**Guidelines for Bridges on STP Projects**

## PAY ITEMS TO BE USED FOR BRIDGES

1. ITEM 501.22 CONCRETE CLASS A  
This item is used to repair deteriorated or damaged concrete posts and replace curb ends that need to be flared. The unit of measure is Cubic Yard.
2. ITEM 507.15 REINFORCING STEEL  
This item is used when concrete posts require repair or curb ends are flared. The unit of measure is LB.
3. ITEM 525.40 BRIDGE RAIL—H.D. STEEL BEAM CURB MTD  
This item is used where new posts and anchor bolts are required. The consultant will be required to compute pullout strength required for bolts that are epoxy grouted in accordance with AASHTO DESIGN GUIDE FOR BRIDGE RAILINGS, and design the new post and brace plate. The unit is LF and is measured from post 1 to post 1 as shown on Detail Sheet 1, and includes rail, posts, offset blocks, and anchor bolts.
4. ITEM 525.40 MOD 1 BRIDGE RAIL—H.D. STEEL BEAM CURB MTD MOD 1  
This item will be used where new steel beam bridge rail is attached to existing concrete or steel posts that are less than 6'3" center to center and a single heavy duty a steel beam is used. The unit is LF and is measured from post 1 to post 1 as shown on Detail Sheet 1, and includes rail and offset blocks.
5. ITEM 525.40 MOD 2 BRIDGE RAIL—H.D. STEEL BEAM CURB MTD MOD 2  
This item will be used where new steel beam bridge rail is attached to existing concrete or steel posts that are greater than 6'3" center to center and a nested heavy duty steel beam is used. The unit is LF and is measured from post 1 to post 1 as shown on Detail Sheet 1, and includes rail and offset blocks. No additional quantity is computed for nesting the steel beam. This is covered in the project special provisions.
6. ITEM 525.40 MOD 3 BRIDGE RAIL—H.D. STEEL BEAM CURB MTD MOD 3  
This item will be used where new steel beam bridge rail with new posts is attached to the bridge using existing anchor bolts. The consultant will be required to design the new post and base plate. The unit is LF and is measured from post 1 to post 1 as shown on Detail Sheet 1, and includes rail, post, and offset block.
7. ITEM 525.41 BRIDGE RAIL—H.D. STEEL BEAM FASCIA MTD  
This item is used for bridges that require new posts and anchor bolts that are mounted on the fascia. This item will very seldom be used. The requirements and measurements are the same as Item 525.40 Bridge Rail—H.D. Steel Beam Curb Mtd.



Figure A-16 (continued)

**Guidelines for Bridges on STP Projects**

8. ITEM 525.41 MOD 1 BRIDGE RAIL—H.D. STEEL BEAM FASCIA MTD

This item will be used where new steel beam bridge rail is attached to existing steel posts that are less than 6'3" center to center and a single heavy duty steel beam is used. The unit is LF and is measured from post 1 to post 1 as shown on Detail Sheet 1, and includes rail and offset block.

9. ITEM 525.41 MOD 2 BRIDGE RAIL—H.D. STEEL BEAM FASCIA MTD MOD 2

This item will be used where new steel beam bridge rail is attached to existing steel posts that are greater than 6'3" center to center and a nested heavy duty steel beam is used. The unit is LF and is measured from post 1 to post 1 on Detail Sheet 1, and includes rail and offset blocks. No additional quantity is computed for nesting the steel beam. This is covered in the project special provisions.

10. ITEM 525.41 MOD 3 BRIDGE RAIL—H.D. STEEL BEAM FASCIA MTD MOD 3

This item will be used where new steel beam bridge rail with new posts is attached to the bridge using existing anchor bolts. The consultant will be required to design the new posts. The unit is LF and is measured from post 1 to post 1 as shown on Detail Sheet 1, and includes rail, post, and offset block.

11. ITEM 529.20 PARTIAL REMOVAL OF STRUCTURE

This item will be used to pay for removal of concrete to flare curb ends or remove pylons. The unit is EACH and a quantity of 1 will be paid for each BRIDGE, NOT EACH CURB END.

12. ITEM 621.21 HEAVY DUTY STEEL BEAM

This item will be used in approach Schedule I and II, and will be factored in accordance with the table shown on Detail Sheet 1.

13. ITEM 621.53 TERMINAL CONNECTOR FOR STEEL BEAM GUARD RAIL

This item will be used TO CONNECT STEEL BEAM RAIL TO EXISTING SOLID CONCRETE BRIDGE RAIL. The unit is EACH and is shown on Detail Sheet 16.

14. ITEM 621.74 ALUMINUM APPROACH RAIL

This item will only be used to connect 3 Rail Aluminum Bridge Rail to Steel Beam Guard Rail. If this item is required, details will be furnished by VAOT Pavement Management Personnel. The unit of measure is LF.

Figure A-17

**Design Exception Request**

AGENCY OF TRANSPORTATION OFFICE MEMORANDUM  
PAVEMENT MANAGEMENT SECTION

TO: Secretary Gershaneck via Director MacArthur *macA.*  
FROM: Alan Campo, Pavement Management via Wm. Michael Hedges Pavement Management Engineer *Wm Michael Hedges*  
DATE: January 27, 1997 *APC*  
SUBJECT: Design Exception Approval for Middlebury NH 9628(1)

Attached is the design exception of the above paving project.

Also attached is the design exception approval flow chart for the Pavement Management Section within the Construction and Maintenance Division. Please note that it differs from Engineering's procedures only in that the recommendation comes from the Pavement Design Manager and Pavement Management Engineer rather than Engineering's Design Exception Committee.

Please approve or disapprove as you see fit and return to Pavement Management.

APPROVAL: *Gordon B. MacArthur*  
Director MacArthur

APPROVAL: *Alan Gershaneck*  
Secretary Gershaneck

APC:kp

Attachment

cc: A.P. Campo  
PM Files

Figure A-17 (continued)

### Design Exception Request

CONSTRUCTION & MAINTENANCE DIVISION  
PAVEMENT MANAGEMENT SECTION  
DESIGN EXCEPTION PROCESS FLOWCHART

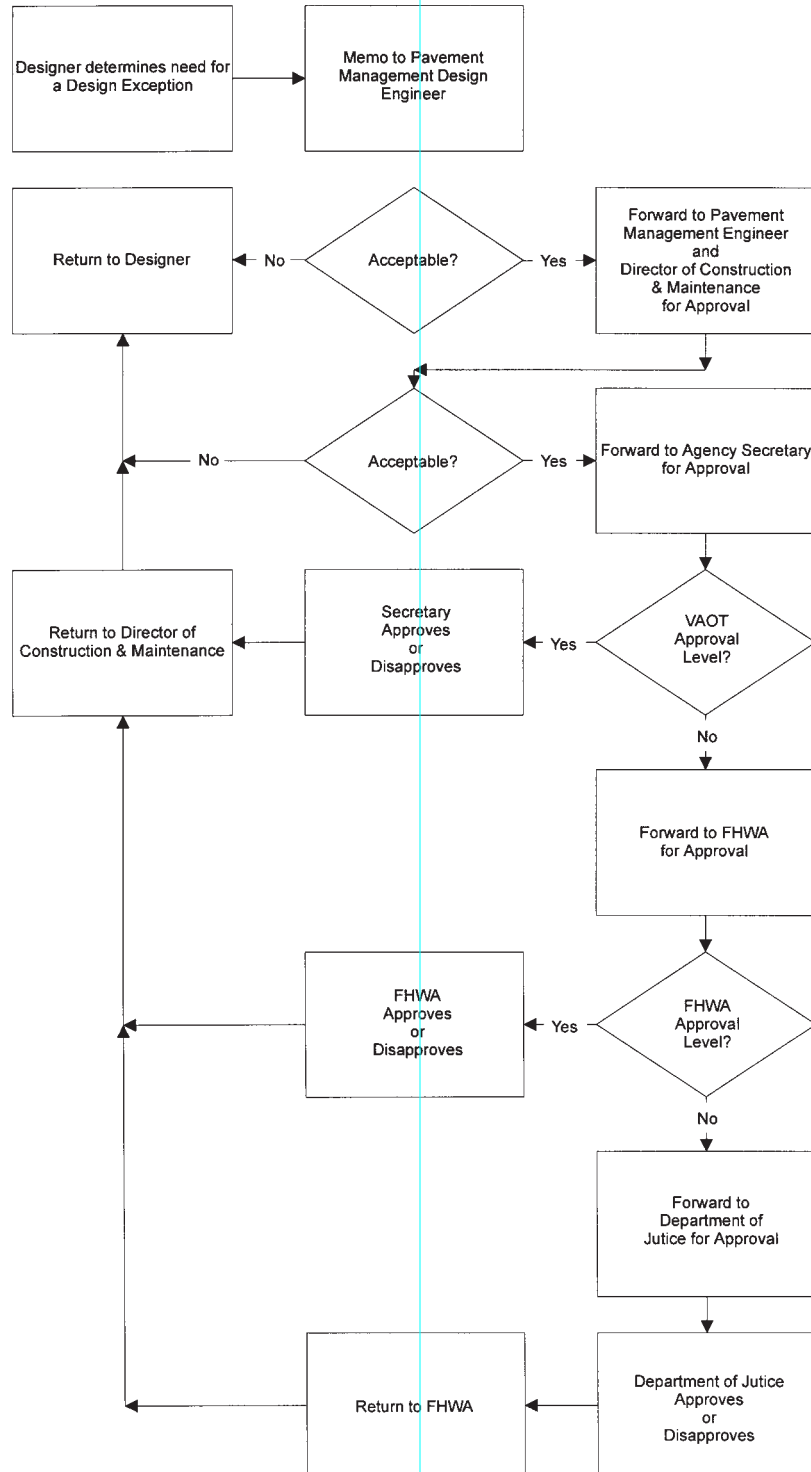


Figure A-17 (continued)

**Design Exception Request**

Project Design Exception  
Middlebury NH 9628

1.0 INTRODUCTION

The project, Middlebury NH 9628, is located on U.S. Route 7 in Middlebury, Addison County, Vermont. The project begins at mile marker (MM) 5.713 and extends northerly approximately 1.2 kilometers (0.75 miles) to MM 6.462. This project is a pavement rehabilitation project with the main objective being to provide a new surface along with some safety enhancements.

2.0 EXISTING CONDITION

The proposed project is through a transitional area between an urban area to the south and a rural area to the north. The speed limit is 40 mph throughout a majority of the project. Currently, a rural highway typical section exists with 3.3 m (11') lanes and paved shoulders that vary between 0.4 m and 0.6 m (1 to 2 feet). Beyond the edges of pavement, there is a 0.6 to 0.9 m (2 to 3 feet) gravel shoulder area. Generally flat (1:4) fill slopes exist on the left side of the road and steep (1:2) cut slopes are on the right side of the road.

The existing roadway section is narrower than the 9.7 m (32 foot) width requirement of the VAOT 3R Policy. It requires a design exception to retain its width and remain a part of this project.

Traffic data for this section of road is as follows:

1997	ADT	9050
1997	DHV	1055
2007	ADT	10360
2007	DHV	1140

3.0 ACCIDENT HISTORY

The section of U.S. Route 7 between MM 5.713 and MM 6.462 has not been identified as a roadway section with a high accident incidence by the VAOT Planning Division. A review of the accident data along this section for the years 1990 through 1994 showed that the few accidents that did occur here were not caused by a narrow roadway section (see attached). It is felt that a wider roadway section would not have prevented the few accidents that have occurred.

Figure A-17 (continued)

**Design Exception Request**

4.0 SAFETY IMPROVEMENTS IN THE DESIGN

The project would accomplish the following improvements: a new overlay, placement of thermoplastic markings and upgrading the signing in accordance with the Manual on Uniform Traffic Control Devices, and upgrading the existing guard rail in accordance with current VAOT standards. The cost of improvements for the 1.2 kilometer (0.75 mile) roadway section would be approximately \$111,000 compared to about \$750,000 to \$1,750,000 to reconstruct that section to a 9.7 m (32 foot) width.

5.0 SUMMARY

To widen the section of U.S. Route 7 between MM 5.713 and MM 6.462 to meet the VAOT 3R policy width of 9.7 m (32 feet) would involve a major reconstruction project. Such a project would take years to scope, design, purchase R.O.W. and obtain permits. A significant amount of area would be impacted by extending the width onto the current fill slopes and into the banks along side the road. A project of this nature is not justified by recent accident history and is beyond the scope of a paving project.

It is therefore requested that this section of roadway be granted a design exception to pave and maintain the existing 3.3 m (11') travel lanes and 0.4 to 0.6 m (1 to 2 feet) paved shoulders.

APPROVED:

Don Michel Hedys  
Pavement Management Engineer

1/27/97  
Date

\_\_\_\_\_  
Director of Construction  
and Maintenance

\_\_\_\_\_  
Date

[19548109.WP]001.SKO

Figure A-17 (continued)  
 Design Exception Request

VERMONT AGENCY OF TRANSPORTATION  
 STATE HIGHWAY SORTED ACCIDENT FILE  
 (PROGRAM NO. H575)  
 YEARS OF DATA 90 91 92 93 94

PAGE 182  
 RUN DATE 10/11/95

ROUTE: US-7

SEQUENCE NUMBER	TOWN	MILEAGE	HM/DD/YY	TIME	WEATHER	CAUSE OF ACCIDENT	TYPE OF ACCIDENT	IHJ FAT	SKFD CODE	SYS CLAS.
1179	MIDDLEBURY	5.08	1/21/90	1300	SNOW	EXCESSIVE SPEED	HIT POLE TO RIGHT	0	1	4 0 0 5
1977	MIDDLEBURY	5.09	4/28/91	1100	CLEAR	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	4 0 0 5
3019	MIDDLEBURY	5.09	10/ 5/93	1000	CLEAR	FAILURE TO YIELD ROM	TURNING-SAME DIR.	2	0	1 4 0 0 5
507	MIDDLEBURY	5.09	1/18/91	800	CLOUDY	FAILURE TO YIELD ROM	TURNING-OPP. DIR.	0	0	1 4 0 0 5
4420	MIDDLEBURY	5.09	11/ 3/92	600	FOG	FAILURE TO YIELD ROM	TURNING-OPP. DIR.	0	0	1 4 0 0 5
4922	MIDDLEBURY	5.14	11/ 2/91	2200	CLEAR	PHY. DEFECT OF OP.	OTHER COLLISION	1	0	1 4 0 0 5
916	MIDDLEBURY	5.17	2/17/93	800	SNOW	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	3 4 0 0 5
814	MIDDLEBURY	5.17	2/10/94	700	CLEAR	SLIPPERY ROAD	RT. ANGLE-BROADSIDE	0	0	3 4 0 0 5
5276	MIDDLEBURY	5.18	10/ 5/90	1400	CLEAR	INATTENTION	REAR END COLLISION	0	0	1 4 0 0 5
4439	MIDDLEBURY	5.18	9/25/91	800	RAIN	CARELESS & NEGLIGENCE	REAR END COLLISION	0	0	1 4 0 0 5
1650	MIDDLEBURY	5.19	4/27/94	1700	CLEAR	FAILURE TO YIELD ROM	TURNING-SAME DIR.	0	0	0 4 0 0 5
4835	MIDDLEBURY	5.22	9/18/91	1500	CLOUDY	INATTENTION	BACKED INTO VEHICLE	0	0	1 4 0 0 5
2066	MIDDLEBURY	5.30	6/ 1/94	1500	CLOUDY	EXCESSIVE SPEED	REAR END COLLISION	0	0	1 4 0 0 5
409	MIDDLEBURY	5.30	1/13/93	1300	SNOW	IMPROPER PASSING	REAR END COLLISION	0	0	1 4 0 0 5
979	MIDDLEBURY	5.30	2/21/93	1400	CLEAR	CARELESS & NEGLIGENCE	REAR END COLLISION	0	0	1 4 0 0 5
557	MIDDLEBURY	5.30	1/16/91	1700	RAIN	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	2	0	1 4 0 0 5
824	MIDDLEBURY	5.30	2/ 2/91	900	CLEAR	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	2 4 0 0 5
3124	MIDDLEBURY	5.30	8/ 5/92	800	CLEAR	FAILURE TO YIELD ROM	HEAD ON COLLISION	2	0	2 4 0 0 5
2624	MIDDLEBURY	5.30	6/25/92	900	CLOUDY	FAILURE TO YIELD ROM	TURNING-OPP. DIR.	0	0	1 4 0 0 5
4157	MIDDLEBURY	5.30	9/10/91	1600	RAIN	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	3	0	1 4 0 0 5
4164	MIDDLEBURY	5.30	11/28/94	1600	RAIN	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	1 4 0 0 5
1619	MIDDLEBURY	5.30	4/ 3/92	1600	CLEAR	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	1 4 0 0 5
5085	MIDDLEBURY	5.30	9/11/90	1500	CLEAR	IMPROPER TURN	TURNING-OPP. DIR.	2	0	1 4 0 0 5
4377	MIDDLEBURY	5.30	10/27/92	1000	CLEAR	FAILURE TO YIELD ROM	TURNING-OPP. DIR.	0	0	1 4 0 0 5
2205	MIDDLEBURY	5.30	4/16/90	1200	CLEAR	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	2 4 0 0 5
3490	MIDDLEBURY	5.30	7/ 3/90	1400	CLEAR	FAILURE TO YIELD ROM	HIT POLE TO LEFT	0	0	1 4 0 0 5
1354	MIDDLEBURY	5.40	3/30/90	700	CLEAR	SLIPPERY ROAD	HIT POLE TO LEFT	0	0	3 4 0 0 5
2325	MIDDLEBURY	5.40	3/30/90	1200	SNOW	INATTENTION	REAR END COLLISION	1	0	1 4 0 0 5
5411	MIDDLEBURY	5.45	9/30/90	1700	RAIN	OTHER ROADWAY FAULT	HIT GUARDRAIL RIGHT	0	0	1 4 0 0 5
3934	MIDDLEBURY	5.74	10/ 3/92	2300	CLEAR	INATTENTION	ROLLED OVER ON RIGHT	1	0	1 4 0 0 5
828	MIDDLEBURY	5.82	2/ 4/91	1600	CLEAR	OTHER VEHICLES	TURNING-OPP. DIR.	0	0	1 4 0 0 5
4015	MIDDLEBURY	5.99	11/14/91	1600	CLOUDY	INATTENTION	OTHER COLLISION	0	0	1 4 0 0 5
1777	MIDDLEBURY	6.28	4/17/92	1600	RAIN	FOLLOWING TOO CLOSE	REAR END COLLISION	2	0	0 4 0 0 5
6946	MIDDLEBURY	6.28	12/30/90	1400	RAIN	INATTENTION	TURNING-SAME DIR.	0	0	1 4 0 0 5
2684	MIDDLEBURY	6.66	6/ 1/91	1600	CLEAR	EXCESSIVE SPEED	ROLLED OVER ON RIGHT	1	0	2 4 0 0 5
4272	MIDDLEBURY	6.66	11/ 5/93	1600	RAIN	FAILURE TO YIELD ROM	REAR END COLLISION	0	0	1 4 0 0 5
1059	MIDDLEBURY	6.66	3/ 4/94	1500	CLOUDY	IMPROPER PASSING	TURNING-SAME DIR.	0	0	1 4 0 0 5
1148	MIDDLEBURY	6.66	1/29/90	1000	SNOW	OTHER VEHICLES	REAR END COLLISION	0	0	3 4 0 0 5
1752	MIDDLEBURY	6.66	3/20/90	1600	SNOW	LEFT OF CENTER	HEAD ON COLLISION	1	0	0 3 4 0 0 5
4920	MIDDLEBURY	6.66	12/12/92	1700	CLEAR	FAILURE TO YIELD ROM	RT. ANGLE-BROADSIDE	0	0	1 4 0 0 5
3090	MIDDLEBURY	6.80	1/17/94	1100	SNOW	EXCESSIVE SPEED	OTHER COLLISION	3	0	1 4 0 0 5
5076	MIDDLEBURY	7.08	9/ 1/90	800	RAIN	INATTENTION	HIT DOMESTIC ANIMAL	0	0	4 4 0 0 5
3446	MIDDLEBURY	7.16	8/ 8/91	300	CLEAR	DRIVER FELL ASLEEP	HIT POLE TO RIGHT	1	0	1 4 0 0 5

\* THIS ACCIDENT OCCURRED PRIOR TO THE LAST HIGHWAY IMPROVEMENT PROJECT. THIS DATA SHOULD NOT BE USED IN AN ANALYSIS WITH OTHER ACCIDENTS AT THE SAME LOCATION.

Figure A-17 (continued)  
Design Exception Request

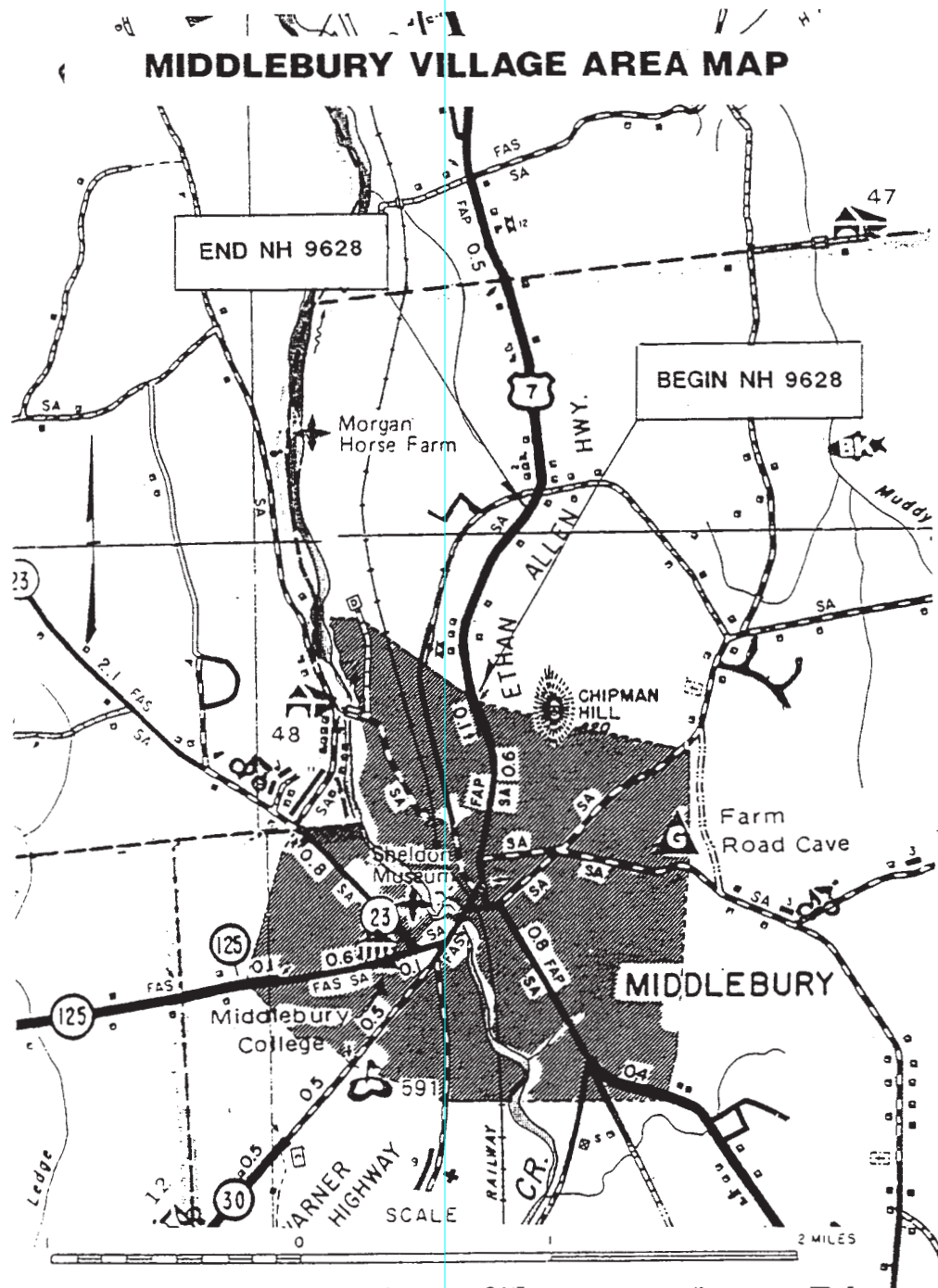


Figure A-18

**List of Scenic Highways**

THE SCENIC HIGHWAYS IN VERMONT ON RECORD AS OF MARCH 15, 1993  
ARE AS FOLLOWS:

<u>Town</u>	<u>Route</u>	<u>Mileage</u>	<u>Year</u>
Cambridge	VT 108	2.568 mi.	1986
Woodstock Town	T-53, Cl. 3	1.490 mi.	1988
Woodstock Village	Old River Road Class 3	0.140 mi.	1988
Charlotte	T-37, Cl. 3	1.60 mi.	1989
Charlotte	T-39, Cl. 3	1.40 mi.	1989
Charlotte	T-36, Cl. 3	0.05 mi.	1989
Hancock	VT 125	7.246 mi.	1986
Middlebury	VT 125	1.386 mi.	1986
Norwich	T-52, Cl. 3	3.00 mi.	1990
Norwich	T-35, Cl. 3	1.36 mi.	1990
Norwich	T-34, Cl. 3	0.86 mi.	1990
Ripton	VT 125	5.786 mi.	1986
Stowe	VT 108	1.147 mi.	1986
Stowe	T-6, Cl. 3	0.090 mi.	1991
Stowe	T-9, Cl. 3	0.900 mi.	1991
Stowe	T-12, Cl. 3	0.500 mi.	1991
Stowe	T-21, Cl. 3	0.310 mi.	1991
Stowe	T-23, Cl. 3	3.400 mi.	1991
Stowe	T-33, Cl. 3	1.100 mi.	1991
Stowe	T-41, Cl. 3	0.520 mi.	1991
Stowe	T-42, Cl. 3	1.700 mi.	1991
Stowe	T-43, Cl. 3	0.800 mi.	1991
Stowe	T-49, Cl. 3	0.900 mi.	1991
Stowe	T-52, Cl. 3	0.850 mi.	1991
Stowe	T-53, Cl. 3	1.000 mi.	1991
Stowe	T-6, Cl. 4	1.410 mi.	1991
Stowe	T-21, Cl. 4	0.190 mi.	1991
Sudbury	T-8, Cl. 3	1.36 mi.	1992



**Title 23, V.S.A., Section 1104**

**§ 1104. Stopping Prohibited**

(a) Except when necessary to avoid conflict with other traffic, or in compliance with law or the directions of an enforcement officer or official traffic-control device, no person may:

(1) Stop, stand or park a vehicle

(A) On the roadway side of any vehicle stopped or parked at the edge or curb of a street;

(B) On a sidewalk;

(C) Within an intersection;

(D) On a crosswalk;

(E) Alongside or opposite any street excavation or obstruction when stopping, standing, or parking would obstruct traffic;

(F) Upon any bridge or other elevated structure or within a highway tunnel;

(G) On any railroad tracks; or

(H) At any place where official signs prohibit stopping.

(2) Stand or park a vehicle, whether occupied or not, except momentarily to pick up or discharge a passenger

(A) In front of a public or private driveway;

(B) Within six feet of a fire hydrant;

(C) Within twenty feet of a crosswalk at an intersection; or

(D) Within twenty feet upon the approach to any flashing signal, stop sign or traffic-control light located at the side of a roadway;

(E) Within twenty feet of the driveway entrance to any fire station and on the side of the street opposite and within seventy-five feet of the entrance to the fire station, when properly sign-posted;

(F) At any place where official signs prohibit standing.

(3) Park a vehicle, whether occupied or not, except temporarily for the purpose of and while actually engaged in loading or unloading merchandise or a passenger

(A) Within fifty feet of the nearest rail of a railroad crossing;

(B) At any place where official signs prohibit parking.

(b) No person may move a vehicle not lawfully under his control into any prohibited area or an unlawful distance away from a curb.—Added 1971, No. 258 (Adj. Sess.), § 2, eff. March 1, 1973.

Figure A-20  
**HAL Analysis**



**webster-martin, inc.**

Consulting Engineers

A DVI Company

P.O. Box 2246  
1025 Airport Drive  
South Burlington, Vermont 05407

Tel: 802-864-0223  
Fax: 802-864-0165  
E-Mail: [wmi@together.net](mailto:wmi@together.net)

July 21, 1997

E. Mark Woolaver  
Design Engineer  
Pavement Management  
VT Agency of Transportation  
133 State Street  
Montpelier, VT 05633

**RE: STP 9712(1)S  
VT Route 128  
Essex-Westford, Vermont  
W-M Project No. 04-9606**

Dear Mr. Woolaver,

As an addition to the scope of work for this project, High Accident Location studies were completed for the sections of VT Route 128 in the town of Essex at mile markers 0.304 to 0.604 and 1.204 to 1.504. Attached is the following information for your review and comment:

1. High Accident Location Analysis and Recommendations
2. Accident Summary Sheets
3. Collision Diagrams

Generally, the following measures, as outlined in the attached report are suggested:

1. Pave with a more skid-resistant surface
2. Include additional or larger warning signs through the areas of concern.
3. Consider studying the possibility of lowering the posted legal speed limits with selective enforcement to achieve driver compliance.

The attached accident summary sheets are the compilation of statistics derived from police reports for the period of 1991 through 1995. This information

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South Burlington, Vermont • Bedford, New Hampshire • Westford, Massachusetts

Figure A-20 (continued)

**HAL Analysis**

Mr. E. Mark Woolaver

Page 2

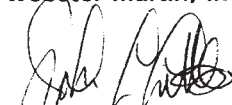
July 21, 1997

indicates that the major cause of accidents in both areas of concern was "too fast for conditions", followed by "operator inexperience" and "excessive speed/alcohol." Light conditions or time did not appear to be major contributing factors, although surface and weather conditions came into play quite often.

Please advise us as to which of these or other measures you wish to pursue and include in our design of this project. If you have any questions or require further information, please call.

Sincerely,

**webster-martin, inc.**



John. L. Little  
Senior Design Technician

Enclosures

highway\1951600

**webster-martin, inc.** \_\_\_\_\_

Figure A-20 (continued)

**HAL Analysis****High-Accident Location Analysis and Recommendations****GENERAL**

The roadway sections between Essex mile markers 0.304 to 0.604 and 1.204 to 1.504 on Vermont Route 128 are listed by the Vermont Agency of Transportation (VAOT) as High Accident Locations. As noted in the accident summaries and the collision diagrams, these mishaps are mainly categorized as the single-vehicle type where the vehicles were out-of-control and left the roadway proper. In many instances, the pavement was slippery due to rain, snow, or ice.

**Mile Marker 1.204 to 1.504**

The only definitive accident pattern on the collision diagrams is noted on the easterly side of Vermont Route 128 at the intersection with Weed Road (TH 63), mile marker 1.2. The highway is posted with a speed limit of 50 mph (80 km/h) with an advisory speed of 25 mph (40 km/h) in this area, and the existing superelevation rates on the 10-degree curve exceed the minimums required for a 40 mph (65 km/h) design speed. There are existing gate-posted curve warning signs with 25 mph (40 km/h) advisory speeds for both northbound and southbound traffic. Seven vehicles traveling in a southerly direction on Route 128 went out-of-control and left the pavement on the opposite side of the roadway (outside edge of the 10-degree curve) just south of the intersection proper. Three similar accidents for the same travel direction were also reported on the opposite side of the roadway where these vehicles left the westerly edge of the roadway. All other collisions have random locations in this High Accident Location.

Although the 40 mph (65 km/h) 10-degree curve on Vermont Route 128 at Weed Road has a posted advisory speed of 25 mph (40 km/h) for both travel directions, excessive speed was cited in six of the ten instances. A more reasonable advisory speed for this location is 35 mph (55 km/h). Many drivers may perceive the recommended value of 25 mph (40 km/h) as over-restrictive and thus ignore the need to reduce their speed on this horizontal curve.

The following suggestions are offered to improve the safety conditions on Vermont Route 128 from mile marker 1.204 to 1.504:

1. Pave the horizontal-curve section with a more skid-resistant surface.
2. Install larger (1200mm x 1200mm) gate-posted curve warning signs in both directions to accentuate the need to slow down.
3. Establish a legal speed limit of 35 mph (55 km/h) on this roadway section with selective enforcement to achieve driver compliance.
4. Revise the advisory speed to 35 mph (55 km/h) if the reduced legal speed limit can not be established.

Figure A-20 (continued)

### **HAL Analysis**

#### **Mile Marker 0.304 to 0.604**

For the roadway section between mile markers 0.304 to 0.604, the most reported accident cause is excessive speed (seven of sixteen mishaps). The highway is posted with a speed limit of 40 mph (65 km/h) in this area. There are existing curve warning signs for traffic in both directions and although there is no advisory speed posted for northbound traffic, there is an advisory speed of 35 mph (55 km/h) for southbound. The existing superelevation rates exceed the required minimums for this curve with a 40 mph (65 km/h) design speed.

The following recommendations are offered to improve the safety conditions on VT Route 128 from 0.304 to 0.604:

1. Pave the horizontal curve section with a more skid-resistant surface.
2. Install gate-posted curve warning signs with 35 mph (55km/h) advisory speeds in both directions.
3. Include large (1200mm x 600mm) arrow warning signs for both northbound and southbound traffic.
4. Establish a legal speed limit of 35 mph (55 km/h) on this roadway with selective enforcement to achieve driver compliance.

Enforcement measures along with engineering improvements are essential in the development of safe roadway conditions.

highway\1951540

Figure A-20 (continued)

**HAL Analysis**  
**ACCIDENT SUMMARY**

Location: VT 123 Essex Mi. 1.20-1.50

Completed By: RBA

No. of Accidents: 17

Date: 3-5-97

Peak Time: 2101-2400

Peak Month: Aug.

Peak Year: 1991

**DAY OF WEEK**

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total	%
001-300					1	1	1	3	17.6
301-600								0	
601-900					1			1	5.9
901-1200		1	1					2	11.8
1201-1400								0	
1401-1800	1		1	1		1		4	23.5
1801-2100			1	1				2	11.8
2101-2400	1	1		1		1	1	5	29.4
Total	2	2	3	3	2	3	2	17	100
%									

Year \ Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
1991						2							2	11.8
1992	1	1					1	3	2		1		8	47.0
1993													0	
1994	1							1	2		1		5	29.4
1995				1								1	2	11.8
Total	2	1	0	1	0	2	1	4	3	0	2	1	17	100
%														

Figure A-20 (continued)

**HAL Analysis**

1.20-1.50

Surface Condition

	Total	%
Dry	<b>6</b>	<b>35.3</b>
Wet	<b>7</b>	<b>41.2</b>
Snow		
Ice	<b>3</b>	<b>17.6</b>
Muddy		
Slushy	<b>1</b>	<b>5.9</b>
Oily		
Leaves		
<b>Total</b>	<b>17</b>	<b>100</b>

Light Condition

	Total	%
Dawn		
Daylight	<b>7</b>	<b>41.2</b>
Dusk	<b>1</b>	<b>5.9</b>
Dark	<b>8</b>	<b>47.0</b>
Dark-Lighted	<b>1</b>	<b>5.9</b>
<b>Total</b>	<b>17</b>	<b>100</b>

Direction

	Total	%
NB	<b>4</b>	<b>23.5</b>
SB	<b>11</b>	<b>64.7</b>
EB	<b>2</b>	<b>11.8</b>
WB		
<b>Total</b>	<b>17</b>	<b>100</b>

Weather Conditions

	Total	%
Clear	<b>5</b>	<b>29.4</b>
Raining	<b>5</b>	<b>29.4</b>
Snowing	<b>2</b>	<b>11.8</b>
Foggy	<b>1</b>	<b>5.9</b>
Hailing		
Clouds Only	<b>4</b>	<b>23.5</b>
Sleeting		
<b>Total</b>	<b>17</b>	<b>100</b>

Causes

	Total	%
<b>Too Fast For Conditions</b>	<b>7</b>	<b>41.2</b>
<b>Failure To Yield ROW</b>	<b>2</b>	<b>11.8</b>
<b>Hazardous Road Conditions</b>	<b>2</b>	<b>11.8</b>
<b>Operating Inexperience</b>	<b>1</b>	<b>5.8</b>
<b>Animal In Roadway</b>	<b>2</b>	<b>11.8</b>
<b>Mechanical</b>	<b>1</b>	<b>5.8</b>
<b>Unknown</b>	<b>2</b>	<b>11.8</b>
<b>Total</b>	<b>17</b>	<b>100</b>

Figure A-20 (continued)

**HAL Analysis**

**ACCIDENT SUMMARY**

Location: VT 123 Essex Mi. 0.21-0.62

Completed By: RBA

No. of Accidents: 14

Date: 3-5-97

Peak Time:

Peak Month: Sept. & Dec.

Peak Year: 1993

**DAY OF WEEK**

Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Total	%
001-300									
301-600									
601-900									
901-1200			1	2				3	21.4
1201-1500			1		1	1		3	21.4
1501-1800					2		1	3	21.4
1801-2100	1					1		2	14.4
2101-2400		1		1	1			3	21.4
Total	1	1	2	3	4	2	1	14	100
%	7.1	7.1	14.3	21.4	28.6	14.4	7.1		100

Month Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
1991	1								2				3	21.4
1992	1										1	1	3	21.4
1993					1				2			1	4	28.6
1994												2	2	14.3
1995				1		1							2	14.3
Total	2	0	0	1	1	1	0	0	4	0	1	4	14	
%	14.4	0	0	7.1	7.1	7.1	0	0	28.6	0	7.1	28.6		100



Figure A-20 (continued)

**HAL Analysis**

0.21-0.62

Surface Condition

	Total	%
Dry	5	35.7
Wet	6	42.9
Snow	1	7.1
Ice	1	7.1
Muddy		
Slushy	1	7.2
Oily		
Leaves		
<b>Total</b>	<b>14</b>	<b>100</b>

Light Condition

	Total	%
Dawn		
Daylight	9	64.3
Dusk	1	7.1
Dark	4	28.6
Dark-Lighted		
<b>Total</b>	<b>14</b>	<b>100</b>

Direction

	Total	%
NB	5	35.7
SB	7	50.0
EB		
WB	2	14.3
<b>Total</b>	<b>14</b>	<b>100</b>

Weather Conditions

	Total	%
Clear	3	21.4
Raining	1	7.1
Snowing	2	14.3
Foggy		
Hailing		
Clouds Only	7	50.0
Sleeting		
<b>Unknown</b>	<b>1</b>	<b>7.2</b>
<b>Total</b>	<b>14</b>	<b>100</b>

Causes

	Total	%
<b>Too Fast For Conditions</b>	<b>7</b>	<b>50.0</b>
<b>Excessive Speed/Alcohol</b>	<b>3</b>	<b>21.4</b>
<b>Inexperienced Operator</b>	<b>3</b>	<b>21.4</b>
<b>Wild Animal in Roadway</b>	<b>1</b>	<b>7.2</b>
<b>Total</b>	<b>14</b>	<b>100</b>

Figure A-20 (continued)  
HAL Analysis

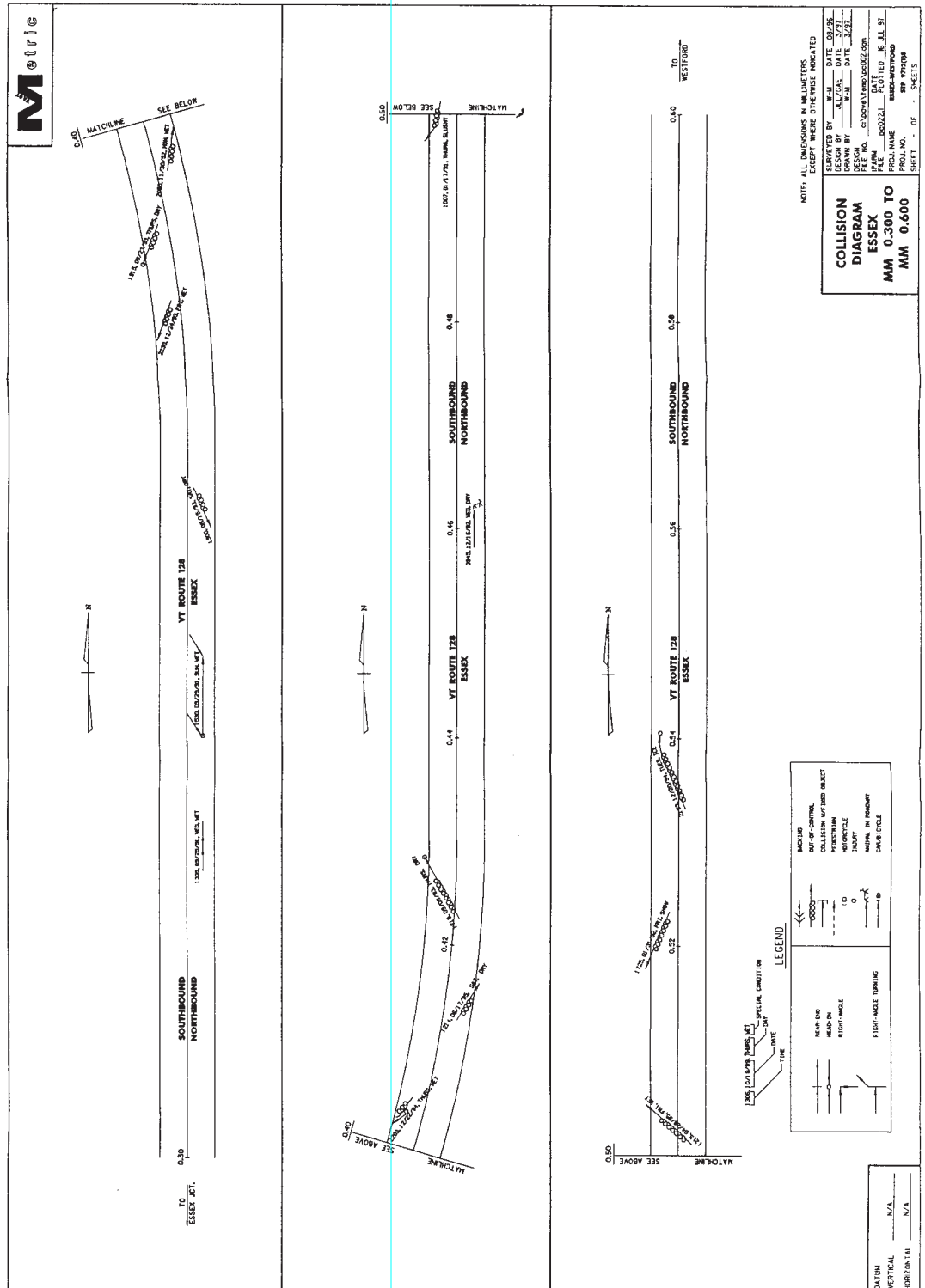


Figure A-20 (continued)  
HAL Analysis

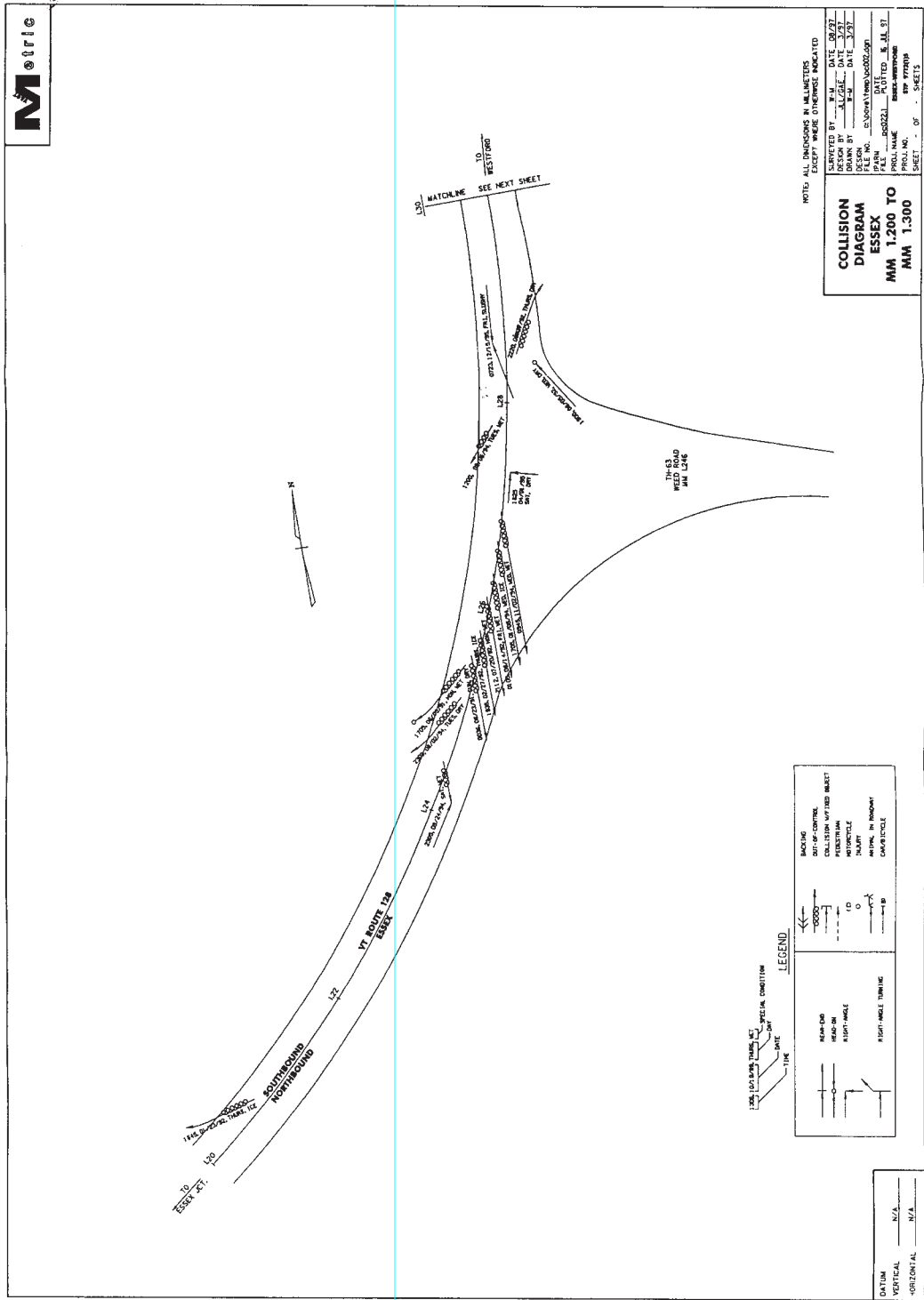


Figure A-20 (continued)  
HAL Analysis

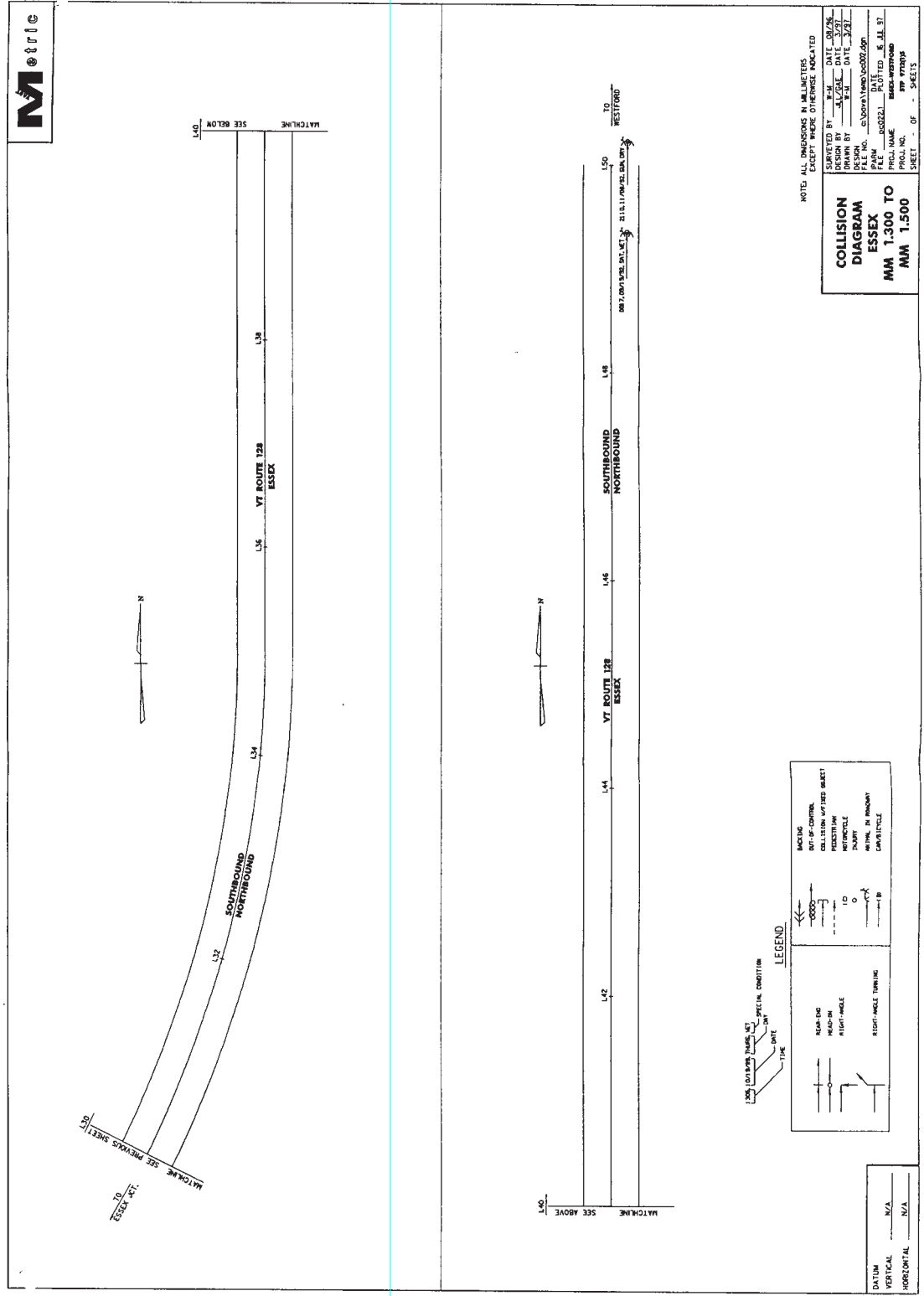


Figure A-21

## Request for Categorical Exclusion



STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
133 State Street, Administration Building  
Montpelier, Vermont 05633-5001



October 9, 1997

Frederick Downs, Division Administrator  
Federal Highway Administration  
Montpelier, VT 05601

Attn: Robert Sikora, Environmental Program Manager

Re: **Stowe/Cambridge STP 9403(1)**

Dear Mr. Downs :

Paving project Stowe/Cambridge STP 9403(1) is located on VT Rt.108 beginning at mile marker 5.537 in Stowe, Vermont and extending northerly along RT 108 for a distance of 8.949 km (5.28mi) to mile marker 2.183 in Cambridge Vermont.

We recommend that the project be classified as a Categorical Exclusion pursuant to 23 CFR 771.117(d)(1) "Environmental Impact and Related Procedures - Categorical Exclusions" as the project consists of modernization of a highway by resurfacing.

This project will remain a two lane highway. Existing guard rail will be replaced. Any deviation from standards will be approved in advance by the Federal Highway Administration unless exempted by the exempt provisions of the Intermodal Surface Transportation Act of 1991.

The project will not involve substantial planning, resources, or expenditures; nor is it likely to induce significant alterations in land use, planned growth, development patterns, traffic volumes, or traffic pattern. It will be necessary to reroute traffic during paving operation; estimated time period one week.

No property protected under the provisions of Section 4(f) of the Department of Transportation Act of 1966 or Section 6(f) of the Land & Water Conservation Fund Act of 1965 will be impacted.

A section of this project is designated as a scenic highway; however in consultation with the Regional Planning Commission and Department of Environmental Conservation District 5 Commission, it has been determined that the project poses no significant impact, therefore review under Act 250 is not required.

No significant environmental impact is expected to result from construction or maintenance of this facility.

Telecommunications Relay Service 1-800-253-0191

Vermont is an Equal Opportunity Employer.

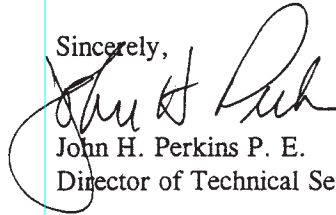
Figure A-21 (continued)

**Request for Categorical Exclusion**

Project **Stowe/Cambridge STP 9403(1)**  
CE Page 2

Please contact us if you need additional information.

Sincerely,



John H. Perkins P. E.  
Director of Technical Services

Endorsement to the Vermont Agency of Transportation

Concur \_\_\_\_\_  
Environmental Program Manager Date

Attachments

Distribution :  
Mike Hedges , Pavement Management Engineer  
Al Blake, ROW  
Marv Kingsbury, Programming  
Contract Administration  
Central Files via JTN  
Project File

Figure A-21 (continued)

**Request for Categorical Exclusion**

**Categorical Exclusion  
Environmental Analysis Sheet**

Town Stowe/Cambridge Project No. STP 9403(1) Route VT RT. 108

Project Setting: Urban \_\_\_\_\_ Village \_\_\_\_\_ Rural X  
Traffic 3070 Year 1998 Typical Varies (see plan sheet #2)

**Project Purpose & Need:**

The purpose of the project is to improve mobility & ridability on the respective highway.  
The need for the project is due to poor surface and guardrail conditions.

**Alternatives Considered:**

1. Do nothing: purpose & need will not be met.
2. VAOT Standard STP paving: purpose and need have been met.

**Project Description:**

The project will involve: resurfacing of the existing highway with a shim/leveling course and wearing course, associated pavement markings, and replacement of existing guardrail.

( Projects that meet the criteria of 23 CFR771.117 (C) need only address those issues marked with an asterisk ( \* ). This does not preclude the need to obtain applicable State and Federal concurrences and permits. )

1. **Air Quality**

Ten year increase in ADT 510 (10,000 allowed maximum per MOA)  
Urban intersection improvement Yes \_\_\_\_\_ No X

2. **Noise**

Alignment moved closer to developed property Yes \_\_\_\_\_ No X  
If yes, apply nomograph. Results \_\_\_\_\_

Figure A-21 (continued)

**Request for Categorical Exclusion**

Environmental Analysis Sheet

Page 2

3. **Water Quality**

Lakes or Ponds

VANR Lakes & Ponds permit Yes \_\_\_\_\_ No X Acquired \_\_\_\_\_

Rivers or Streams

VANR Stream Alteration permit Yes \_\_\_\_\_ No X Acquired \_\_\_\_\_

Wetlands

\* Involved Yes \_\_\_\_\_ No X Vermont Classification \_\_\_\_\_

\* Wetland Impact area: Temporary \_\_\_\_\_ Permanent \_\_\_\_\_

\* Buffer Impact area: Temporary \_\_\_\_\_ Permanent \_\_\_\_\_

\* VANR Conditional Use Determ. Yes \_\_\_\_\_ No X Acquired \_\_\_\_\_

401 Water Quality Certification Yes \_\_\_\_\_ No X Acquired \_\_\_\_\_

Stormwater Discharge Permit Yes \_\_\_\_\_ No X Acquired \_\_\_\_\_

Flood plains Encroachment Yes \_\_\_\_\_ No X Area \_\_\_\_\_

Significance (Describe) \_\_\_\_\_

Ground Water/Surface Water/Well Impacts Yes \_\_\_\_\_ No X

(Describe) \_\_\_\_\_

ANR Comments see VAOT memo dated 9/15/97

COE Comments \_\_\_\_\_

4. **U.S. Army Corps of Engineers**

Section 404 Permit Required Yes \_\_\_\_\_ No X

Permit Type \_\_\_\_\_

5. **U.S. Coast Guard**

Navigable Waters Yes \_\_\_\_\_ No X

Section 124a Permit Required Yes \_\_\_\_\_ No \_\_\_\_\_

6. **Threatened and Endangered Species and Habitat**

Present in Project Area Yes \_\_\_\_\_ No X

ANR Non-Game and Natural Heritage Program comments See memo dated 9/15/97

USF&WS comments \_\_\_\_\_

7. **Agricultural Land**

Prime/secondary/locally important soils affected Yes \_\_\_\_\_ No X

Current Land Use \_\_\_\_\_

Form 1006 Parts I, III, VI, VII, completed Yes \_\_\_\_\_ No \_\_\_\_\_

Form 1006 Parts II, IV, V completed Yes \_\_\_\_\_ No \_\_\_\_\_

Vermont Department of Agriculture comments \_\_\_\_\_



**Request for Categorical Exclusion**

Environmental Analysis Sheet

Page 3

8. **Hazardous/Residual Waste Liabilities**

Present in project area	Yes _____	No <u>X</u> _____
Determination from VANR list	Yes <u>X</u> _____	No _____
Determination from field visit	Yes _____	No <u>X</u> _____
Borings completed	Yes _____	No <u>X</u> _____
Petroleum related wastes	Yes _____	No <u>X</u> _____
CERCLA involvement	Yes _____	No <u>X</u> _____
Remediation required	Yes _____	No <u>X</u> _____

Describe \_\_\_\_\_  
\_\_\_\_\_

\* 9. **Historical or Archaeological Resources (Section 106)**

Historic Resources: Present in project area Yes \_\_\_\_\_ No X \_\_\_\_\_  
Archeological Resources: Present in project area Yes \_\_\_\_\_ No X \_\_\_\_\_  
Section 106 findings No effect \_\_\_\_\_  
Memorandum of Agreement needed Yes \_\_\_\_\_ No X Executed \_\_\_\_\_  
SHPO coordination completed 10/8/97 \_\_\_\_\_  
Advisory Council coordination completed \_\_\_\_\_

\* 10. **Section 4(f) Resources**

Present in project area Yes \_\_\_\_\_ No X \_\_\_\_\_  
Nature of Section 4(f) involvement:  
\_\_\_\_\_ Public Land \_ Wildlife and Waterfowl Refuge \_\_\_\_\_ Historic Property  
Temporary use Yes \_\_\_\_\_ No \_\_\_\_\_ (Coordinate with FHWA on determination)  
Section 6(f) involvement (LWCF Funding) Yes \_\_\_ No X \_\_\_\_\_  
Dept. of Interior coordination completed \_\_\_\_\_ ( Not required for Programmatic 4(f)s )

\* 11. **Right of Way**

New ROW Acquisition	fee simple	Yes _____	No <u>X</u> _____
	easement	Yes _____	No <u>X</u> _____

Description of taking \_\_\_\_\_  
Improved properties acquired Yes \_\_\_\_\_ No X \_\_\_\_\_  
Displacements Rental Units \_ Private Homes \_\_\_\_\_ Businesses \_\_\_\_\_  
Relocation services to be provided \_\_\_\_\_  
Properties available for relocation \_\_\_\_\_

Figure A-21 (continued)

**Request for Categorical Exclusion**

Environmental Analysis Sheet  
Page 4

12. **Public Participation Opportunity**

Pre-Design Site meeting Yes  No  Date 10/1/97

Public Information meeting Yes  No  Date

Public Hearing required Yes  No  Date

Comments by Local Officials/RPC's Paving of no concern, guardrail replacement acceptable to Regional Planning Commission.

13. **Social & Economic Concerns**

Project consistent with local and Regional Land Use Plans Yes  No

Describe  (Attach correspondence from officials)

Neighborhood and Community Concerns Yes  No

Churches  Elderly

Schools  Minorities

Low Income Housing  Handicapped

Emergency Services  Environmental Justice Exec. Order 12898

Describe

Pedestrian facilities Sidewalks > 5 ft. Yes  No

Bicycle facilities Paved Shoulders > 4 ft. Yes  No

Describe

Effect on local business Yes  No  (Describe)

Temp. effect on business Yes  No  (Describe)

Loss of Parking Yes  No  (Describe)

14. **Temporary Effects or Aesthetic Concerns**

Detour required Yes  No  Length  (Attach Plans)

Temporary bridge required Yes  No  (Attach Plans)

Adverse effects Detour by alternate routes 100 & 15 may increase travel time by 10-15 minutes

Public and public official notification or involvement

Scenic Byway/VT Scenic Highway Yes  No

National/State Forest Highway Yes  No

Describe Resurfacing of existing highway. Guard rail replacement in accordance with scenic guidelines established by the Regional Planning Commission.

Figure A-21 (continued)  
**Request for Categorical Exclusion**

Environmental Analysis Sheet  
Page 5

**Field Inspection Comments:** Project will have no impact on the historic or scenic qualities of this highway. Threatened & Endangered species present in corridor will not be effected by on alignment paving or guard rail replacement. Staff biologist recommends guard rail be installed from the roadway to ensure protection of species of concern.

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Allison Murray  
Signature

10/9/97  
Date

Reviewed by:

John Mark  
Signature

10.9.97  
Date

( Note: Full documentation of the information summarized herein is preserved in the project files of the VAOT Planning Division. When appropriate, more detailed descriptions of resources and/or impact analyses should be attached to this form. )

**Impact Mitigation Requirements**

Describe: Staging/Storage areas must be restricted to existing parking areas at Stations #12+400 (both sides of roadway), 1+670, and 3+513.73

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Figure A-21 (continued)

**Request for Categorical Exclusion**

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

**TO:** Allison Murray, Environmental Specialist  
**FROM:** John Lepore, Transportation Biologist  
**DATE:** September 15, 1997  
**SUBJECT:** STOWE / CAMBRIDGE STP 9403

The purpose of this memorandum is to let you know that I have completed my review of the preliminary plans for this resurfacing project and guardrail replacement project. Based upon the fact that the work involves resurfacing existing surfaces, guardrail replacements, sign replacements, and pavement markings, I have determined that it will not impact any resources.

Note however, besides being a "Scenic Roadway", the VT 108 corridor has several species and habitats of special concern adjacent to it, particularly in its higher elevations. Thus, in order to avoid impacts to these resources and their associated permits, I recommend the following:

- 1.) All work, including the guardrail replacements, should be done from the existing pavement so as not to cause any unnecessary impacts;
- 2.) The placement of the staging area for equipment and materials be located at the northern end of the project or in a known disturbed site such as the existing Smuggler's Notch Ski Area parking lot;
- 3.) Although erosion is not anticipated to be a problem, erosion controls should be installed, monitored, and repaired (as necessary) in any area of earthwork.

If in the future, the scope of this project is modified, I would appreciate another opportunity to comment.

JEL:JI

cc: Technical Services via JTN  
Duncan Wilkie - Bob McCullough  
Central Files

Figure A-21 (continued)

**Request for Categorical Exclusion**



STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
133 State Street, Administration Building  
Montpelier, Vermont 05633-5001



October 8, 1997

Mr. Townsend Anderson  
State Historic Preservation Officer  
Vermont Division for Historic Preservation  
135 State Street, Drawer 33  
Montpelier, Vermont 05633-1201

Re: Stowe-Cambridge STP 9403

Dear Towny:

In order to assist the Federal Highway Administration in complying with Section 106 of the National Historic Preservation Act of 1966 and its amendments, the Vermont Agency of Transportation (VAOT) has reviewed this undertaking according to the standards set forth in 36 C.F.R., regulations established by the Advisory Council on Historic Preservation to implement Section 106. Project review consists of identifying the project's potential impacts to historic buildings, structures, districts, landscapes, and settings, and to known or potential archeological resources.

This project involves the resurfacing of VT Route 108 on its existing location in the towns of Stowe and Cambridge. The project begins at mm 5.537 in Stowe and extends northerly for a distance of 5.281 miles to mm 2.183 in Cambridge. The gravel shoulders and parking areas will remain unpaved. An intersection where the Stowe Resort access roads meet VT 108 will be redesigned and resurfaced.

The existing guardrail, which is primarily steel w-beam with some steel cable rail, will be replaced throughout the project route. North of the Spruce Mountain access road, all new guard rail will be wooden, while south of the access road steel w-beam guard rail will be used. Much of the existing guardrail will be extended several feet in order to add MELTs, but no guardrail will be placed in front of the large boulders at the top of the notch. New guardrail will be added at one new location in Cambridge, between mm 1.274 (sta. 2+051) and mm 1.463 (sta. 2+355) on the southbound side of the road.

The project area is part of the Smuggler's Notch Rural Historic District. The corridor is historically significant as an early transportation path first used by Abenaki Indians, as a portage route for smugglers, and for its association with the development of tourism and hiking in Vermont. Several historic resources were identified in a report by the historic preservation

Telecommunications Relay Service 1-800-253-0191

Vermont is an Equal Opportunity Employer.

Figure A-21 (continued)

### **Request for Categorical Exclusion**

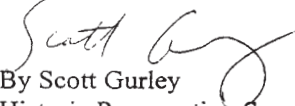
consulting firm of Liz Pritchett Associates. These contributing resources include Vermont Route 108, the Long Trail, Barnes Camp, the Big Spring Area, and the Picnic Area. Smuggler's Notch is eligible for the National Register of Historic Places for its association with events that have made a significant contribution to the broad patterns of our history (Criteria A).

We have reviewed this project in an effort to determine impacts on historic resources. The addition of new guardrail from mm 1.274 to mm 1.463 will not affect any of the characteristics that make Smuggler's Notch eligible for the National Register. VAOT's Archeologist has reviewed this project and determined that there are no properties of archeological significance within the proposed work areas. The Big Springs area has been identified as archeologically sensitive, but this area is outside the project area and will not be disturbed. Consequently, after reviewing the potential impact of this project we have determined that it qualifies for the category of "No Effect" under section 5 (b) of our Programmatic Agreement, dated February 1, 1996.

Under the terms of the Programmatic Agreement we are hereby notifying you that we have made this finding, and the documentation that supports this finding is now available for your inspection.

According to our standard practice, all waste, borrow, fill, and staging areas lying outside the project area will require review by the Agency of Transportation's archeologist and clearance from your office. The construction firm will supply information about the exact locations of these areas to the agency's archeologist, and this provision will be part of the "Special Provisions" section of any construction contract.

Sincerely,  
John H. Perkins, PE  
Director of Technical Services

  
By Scott Gurley  
Historic Preservation Specialist, VAOT

SCG: hs  
c: central files via John Narowski  
project development files via Allison Murray

Attachments: map  
site plans  
video lodge photo

**Title 19, V.S.A., Section 306a**

**§ 306a. Class 1 town highways; agency responsibility for scheduled surface maintenance.**

(a) Unless otherwise directed by the legislative body of a municipality, the agency shall assume direct responsibility for scheduled surface maintenance of all class 1 town highways, at no expense to the municipality. The class 1 town highways shall be included in the agency's pavement management system and analyzed for resurfacing needs and considered for programming of available federal and state funds on the same basis as state highways.

(b) The provisions of this section shall not affect any legislative body's jurisdiction over class 1 town highways or any municipality's responsibility for general maintenance of class 1 town highways, including, but not limited to, spot patching, traffic control devices, curbs, sidewalks, drainage and snow removal.

(c) Notwithstanding the provisions of this section, major reconstruction of class 1 town highways, beyond the usual scope of resurfacing, shall continue to be a municipal responsibility, subject to availability of federal and state aid under chapter 15 of this title and payment of uniform local share under section 309a of this title.—Added 1993, No. 61, § 11, eff. June 3, 1993; amended 1995, No. 183 (Adj. Sess.), § 18c, eff. May 22, 1996.

HISTORY

Amendments—1995 (Adj. Sess.). Subsection (a): Deleted the third sentence.

Figure A-23

**Railroad Agreement**

**RIGHT-OF-WAY FINANCE and MAINTENANCE AGREEMENT  
BETWEEN  
STATE of VERMONT,  
and  
NEW ENGLAND CENTRAL RAILROAD, INC.,  
for  
NORTHFIELD-BERLIN STP 9467(1)S  
EA/SUBJOB 9499001/100**

**THIS AGREEMENT**, made and concluded this 16 day of December, 1996, by and between the State of Vermont, a sovereign state, acting through its Agency of Transportation, with its principal office at 133 State Street, Montpelier, Vermont 05633-0001 (the "State"), and New England Central Railroad, Inc., a Delaware corporation, with its principal office at 2 Federal Street (Suite 201), St. Albans, Vermont 05478-2003 ("NECR").

**WITNESSETH :**

**WHEREAS**, the State has submitted to the Federal Highway Administration of the United States Department of Transportation, for approval, a federal-aid project (the "Project"), namely Northfield-Berlin STP 9467(1)S, located in the Towns of Northfield and Berlin, County of Washington and State of Vermont, which is further described as follows:

Beginning in Northfield approximately 0.996 mile south of the Northfield-Berlin town line and extending northerly along Vermont Route 12 for a distance of 7.686 miles to mile marker 6.690 at the Berlin-Montpelier town line. Not included under this Project is that portion of Vermont Route 12 in Berlin from mile marker 5.763 to mile marker 5.971;

Work to be performed under this Project includes resurfacing of the existing highway with a shim/leveling course, wearing course, associated pavement markings, new guardrail, and incidental items. Also included under this Project is the reconstruction of that portion of Vermont Route 12 beneath the railroad overpass, bridge #71, Berlin mile marker 4.94, and a new prefabricated rail-highway crossing and associated reconstruction at Berlin mile marker 2.13;

and

**WHEREAS**, the Project will encroach on property owned by NECR;

**NOW, THEREFORE**, in consideration of the premises and the mutual covenants and premises herein set forth, it is agreed by the parties hereto, as follows:

**1. Responsibility for the Project.** The Project work will be done by contract under the supervision of the State or its duly authorized representative.



**Railroad Agreement**

Agreement for Northfield-Berlin STP 9467(1)S

Page 2

**2. Indemnification; Railroad Protective Liability Insurance.** All contractors hired by the State pursuant to this Agreement will be required to indemnify and save harmless the NECR, and the State, their successors and assigns, and their agents and employees, against all loss, cost, damage and expense, including damage to NECR property, or the property of others, injury or death to NECR employees or to others due directly in any way to the work done by the contractor while working within the railroad right-of-way during the construction of this Project, as covered by this Agreement. In this connection, the State will require its contractors to secure policies of insurance in the name of the NECR, and the State providing railroad protective liability coverage of \$2,000,000.00 per occurrence and \$6,000,000.00 in the aggregate for the NECR, all as specified by 23 C.F.R. Part 646 ("Railroads), Subpart A ("Railroad-Highway Insurance Protection) and the latest edition of the Vermont Agency of Transportation's *Standard Specifications for Construction*, Section 103.11(d) ("Railroad Protective Liability Insurance"). Named insureds shall be New England Central Railroad, Inc., and the State of Vermont.

**3. Additional Insurance.** All contractors hired by the State for the Project will be required to secure Contractor's Liability Protection Insurance providing bodily injury and property damage liability coverage that meets the minimum amounts specified in the latest edition of the Vermont Agency of Transportation's *Standard Specifications for Construction*, Section 103.11(b).

**4. Conditions Causing Railroad Hazard.** The State will include in the proposal and contract forms for this Project Attachment #2 to this Agreement ("General Statement of Conditions Causing Railroad Hazard"), which is incorporated by reference.

**5. Project Deemed Undertaken for Benefit of Highway Users.** Under the provisions of 23 C.F.R. Part 646 ("Railroads"), Subpart B, ("Railroad-Highway Projects"), the State finds that the work of the Project affecting NECR is necessary so that the Project may be properly constructed for the safety of the highway traveling public and, consequently, that the NECR should not be assigned any liability for Project costs.

**6. Right of Entrance to Railroad Right-of-Way.** NECR grant the State and/or the State's contractor right of entrance to the railroad right-of-way so that the Project may be completed.

**7. Temporary Rights.** NECR grant the State and/or the State's contractor the temporary rights shown on the Project plans and included in this Agreement through Attachment #1, which is incorporated by reference.

**8. Waiver of Right to Appraisal and Compensation.** NECR waive the right to an appraisal and compensation for rights to construct and maintain the Project in the areas described by the right-of-way plans for the Project. The rights waived by NECR are further described in Attachment #3 to this Agreement, "Waiver of Appraisal, Compensation, and Payments," which is incorporated by reference.

Figure A-23 (continued)

**Railroad Agreement**

Agreement for Northfield-Berlin STP 9467(1)S

Page 3

**9. Tax Compliance.** As required by Vermont law (32 V.S.A. Section 3113), NECR hereby certifies, under the pains and penalties of perjury, that it is in good standing with respect to, or in full compliance with a plan to pay, any and all taxes due the State of Vermont as of the date it signs this Agreement.

**10. Incorporations by Reference.** The following attachments are incorporated to and made a part of this Agreement:

- Attachment #1 - Plan Sheet
- Attachment #2 - General Statement of Conditions Causing Railroad Hazard
- Attachment #3 - Waiver of Appraisal, Compensation and Payments by New England Central Railroad, Inc.

**11. Entire Agreement.** This Agreement constitutes the entire agreement between the parties relating to the subject matter hereof, supersedes all prior oral or written negotiations, agreements, understandings and courses of dealing between the parties relating to the subject matter hereof and is subject to no understandings, conditions or representations other than those expressly stated herein. This Agreement may only be modified by a writing which states that it modifies or amends this Agreement and which is signed by both parties.

**12. Section Headings.** The section headings contained in this Agreement are for reference and convenience only and in no way define or limit the scope and contents of this Agreement or in any way affect its provisions.

**13. Miscellaneous.** This Agreement shall be binding upon and inure to the benefit of the parties and their respective successors and assigns.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed on the day and year first written above.

**Railroad Agreement**

Agreement for Northfield-Berlin STP 9467(1)S

Page 4

WITNESS:

**NEW ENGLAND CENTRAL RAILROAD,  
INC.**

**("NECR")**

Louise G. Corbure By:

[Signature]  
Its [Signature]  
and duly authorized agent

WITNESS:

**STATE OF VERMONT  
AGENCY OF TRANSPORTATION**

**("State")**

[Signature] By:

[Signature]  
Its Secretary of Transportation  
and duly authorized agent

APPROVED:

[Signature]  
Rail-Highway Crossing  
Program Manager

APPROVED AS TO FORM:

DATE: 11-26-90

[Signature]  
ASSISTANT ATTORNEY GENERAL

AGREEMENT REVIEWED  
NO AUDIT REQUIRED

By: [Signature]

Date: 11/26/90

Figure A-23 (continued)

**Railroad Agreement**

**ATTACHMENT #2**

**GENERAL STATEMENT of CONDITIONS CAUSING RAILROAD HAZARDS  
for  
NORTHFIELD-BERLIN STP 9467(1)S**

**SCOPE**

Provisions for safeguards to the property and operations of the New England Central Railroad, Inc. ("RAILROAD") during construction by the contractor.

**GENERAL**

The contractor shall notify the RAILROAD and receive a permit from the RAILROAD at least thirty (30) days in advance of starting work and/or locating equipment on the RAILROAD right-of-way and property.

Equipment of the contractor to be adjacent to the tracks shall be in first class conditions so as to fully prevent any failure that would cause delay in the operation of trains or damage to RAILROAD facilities. Equipment shall not be placed or put in operation adjacent to a track without first obtaining permission of the RAILROAD.

The contractor's work shall be performed in such a manner that the tracks, traffic, and appurtenances of the RAILROAD will be safeguarded. The contractor shall ascertain and comply with the requirements of the RAILROAD relative to their work on or adjacent to RAILROAD premises and shall keep the tracks clear of obstructions.

The RAILROAD will provide flaggers, inspection and other protective services as necessary for protection of railway traffic and property and for those engaged on the work during the period when the nature of the construction operations are such as to make it necessary. The character and extent of these services shall be as determined by the RAILROAD as the work progresses.

These services will be at the sole expense of the contractor.

The contractor shall reimburse the RAILROAD for all necessary flagging and inspection services required by these specifications or make satisfactory arrangements for such reimbursement. Final settlement with the contractor shall be contingent on certification that the RAILROAD has been reimbursed.

**Railroad Agreement**

General Statement of Conditions Causing Railroad Hazards  
for Northfield-Berlin STP 9467(1)S

Page 2 of 2

The RAILROAD will install, maintain and remove any temporary crossings, if required, at the request and expense of the contractor. The anticipated train schedule will be as follows:

Amtrak South-bound #55 0830-1030 each day  
Amtrak North-bound #56 1900-2100 each day  
unscheduled freights

**NOTE:** Occasional unscheduled trains must be anticipated.

It will be the responsibility of the contractors to coordinate their work with the railroad each day by contacting Eugene J. Trombly, Roadmaster of the New England Central Railroad, at 802-527-3411. If at any time a delay of normal train service is caused by the contractor, the contractor shall be assessed an agreed to and/or stipulated charge calculated at the rate of two hundred dollars (\$200.00) for the first hour or fraction there of, and increasing by one hundred dollars (\$100.00) per hour for each additional hour, to cover any and all damages resulting from the delay. This time will begin fifteen (15) minutes after the scheduled time for the train to arrive at the work site and ending at the time the train is allowed to pass. Payment will be due only upon satisfactory evidence that the delay actually occurred.

**HAZARDS**

An operating track shall be considered fouled and subject to hazard when any object or operation is brought closer than fifteen (15) feet to the centerline of the tracks.

A signal line or communication line shall be considered fouled and subject to hazard when any object is brought closer than four (4) feet to any wire of the line. An electrical supply line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any wire of the line.

Cranes, trucks, power shovels or any other equipment shall be considered as fouling a track, signal line, communication or electric supply line when working in such a position that failure of equipment with or without lead could foul the track, signal line, communication or electric supply line. None of these or similar operations shall be carried on during the approach or passing of a train.

In the construction of staging, falsework or forms, the contractor shall maintain a minimum vertical clearance of twenty-two (22) feet above the top of high rail and a minimum side clearance of fifteen (15) feet from the center line of track during the approach or passing of a train.

Figure A-23 (continued)

**Railroad Agreement**

**ATTACHMENT #3**

**WAIVER of APPRAISAL, COMPENSATION and PAYMENTS  
by NEW ENGLAND CENTRAL RAILROAD, INC.  
for  
NORTHFIELD-BERLIN STP 9467(1)S**

New England Central Railroad, Inc., having been informed of its right to receive just compensation based upon an appraisal for property and/or rights to be acquired from it by the State of Vermont for highway Project Northfield-Berlin STP 9467(1)S, and having been informed of the full effect of said highway Project on its property, and having been duly informed of any and all its rights and eligibilities under the "Uniform Relocation and Assistance and Land Acquisition Policies Act of 1970", does hereby waive its rights to said appraisal, compensation, payments and/or other benefits to which it would be entitled.

**WITNESSES:**

**NEW ENGLAND CENTRAL RAILROAD, INC.**

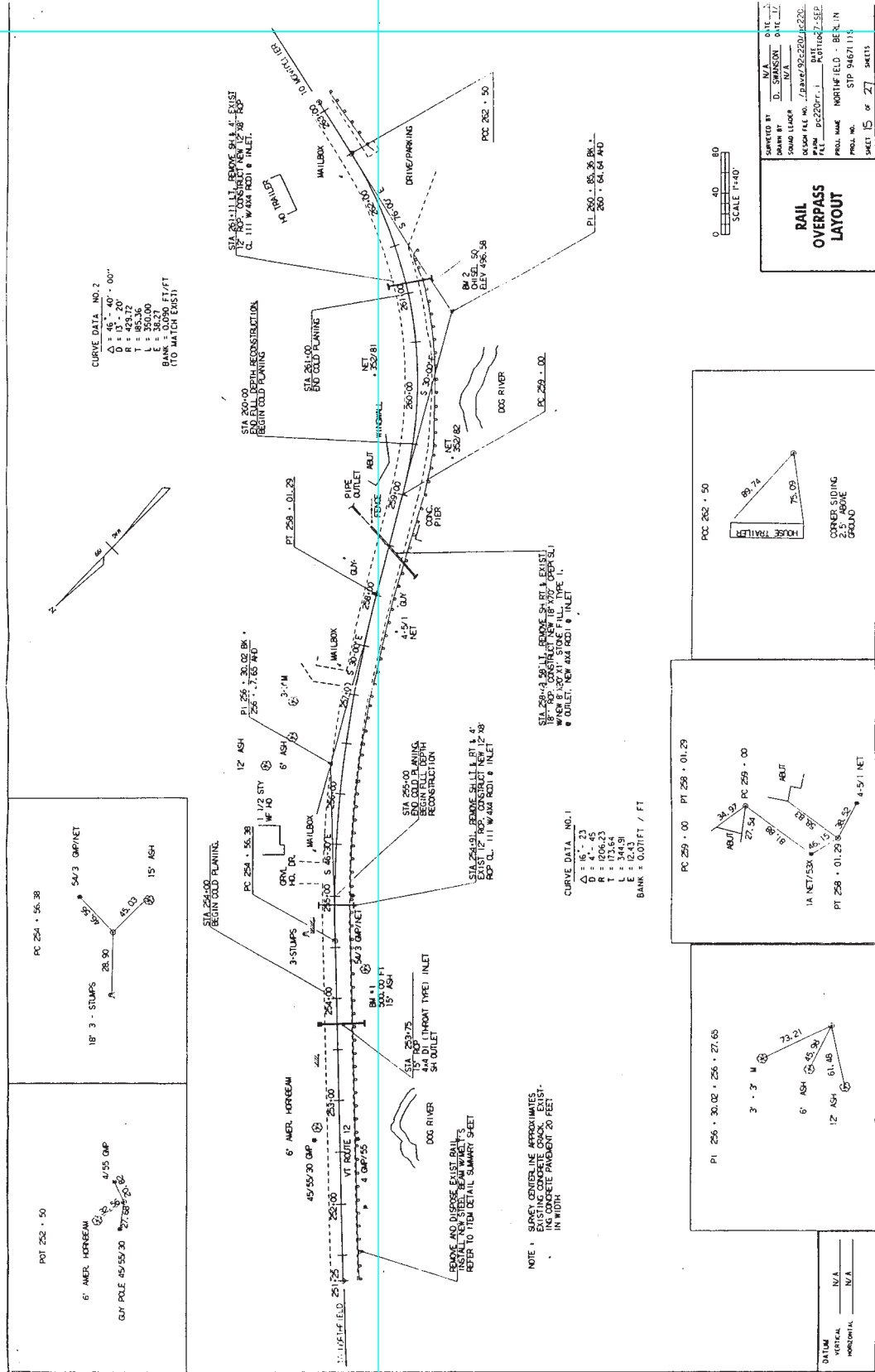
Louise H. Gorbunov

By: Dale W. Lathrop

[Signature]

Its General Manager  
and authorized agent

Figure A-23 (continued)  
 Railroad Agreement



DESIGNED BY	D. SPANSON	DATE	11/17
DRAWN BY			
CHECKED BY			
PROJECT NO.	PC220-1-1	SHEET NO.	7-52P
PROJECT NAME	NORTHFIELD - BELLEVILLE	SHEET TOTAL	11/11

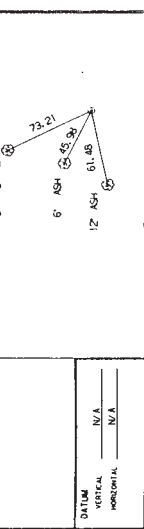
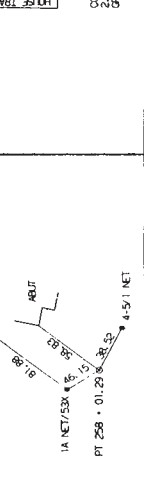
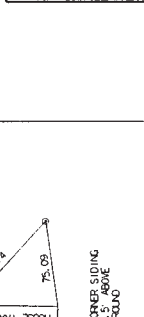


Figure A-24

**Utilities—Letters and Special Provisions  
State System**

AGENCY OF TRANSPORTATION

INTEROFFICE MEMORANDUM

Utilities Section



**TO:** Stephen O'Connor, Chief of Contract Administration  
**FROM:** Todd Ronson, Utilities Project Supervisor  
*T. Ronson*  
**DATE:** February 10, 1997  
**SUBJECT:** Springfield-Weathersfield STP 9461(1)S & Weathersfield STP 9475(1)S

We forward herein Utility Special Provisions to be incorporated into project documents.

TR:mw  
Attachment

cc: Wm. Michael Hedges, Pavement Management Engineer  
Construction Division, ATTN: Regional Const. Engr.  
or Resident Engineer  
Allan Remick, DTA #2  
Central Files via FCE  
Utility Files via CAW

FEB 12 1997



*Figure A-24 (continued)*

**Utilities—Letters and Special Provisions  
State System**

**SPRINGFIELD-WEATHERSFIELD STP 9461(1)S**

**February 10, 1997**

**UTILITY SPECIAL PROVISIONS**

Existing underground facilities owned by Vermont Telephone Company, Inc. will not require adjustment. The contractor is cautioned to protect these facilities from damage. The buried cable is located at Mile Marker 3.195 in Springfield to Mile Marker 1.75 in Weathersfield.

Employees or agents of the above listed utility company are to be allowed free and full access within the project limits with the tools, material, and equipment necessary to install, operate, maintain, place, replace, relocate, and remove their facilities.

There will be no extra compensation paid to the highway contractor for any inconvenience caused by working around and with the utility company.

Should the contractor desire additional adjustments of the utility facilities for his/her convenience, proper arrangements shall be made in conformance with Subsection 105.07 of the Standard Specifications for Construction.

*Figure A-24 (continued)*

**Utilities—Letters and Special Provisions  
State System**

**WEATHERSFIELD STP 9475(1)S**

**February 10, 1997**

**UTILITY SPECIAL PROVISIONS**

Existing underground facilities owned by Adelphia Cable Communications will not require adjustment. The contractor is cautioned to protect these facilities from damage. The buried cable is located on the north side of VT 131 from Mile Marker 7.2 to Mile Marker 8.00, approximately 6 inches off pavement.

Employees or agents of the above listed utility company are to be allowed free and full access within the project limits with the tools, material, and equipment necessary to install, operate, maintain, place, replace, relocate, and remove their facilities.

There will be no extra compensation paid to the highway contractor for any inconvenience caused by working around and with the utility company.

Should the contractor desire additional adjustments of the utility facilities for his/her convenience, proper arrangements shall be made in conformance with Subsection 105.07 of the Standard Specifications for Construction.

Figure A-25

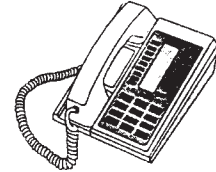
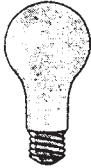
**Utilities—Letters and Special Provisions  
Class 1 Town Highways**

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**AGENCY OF TRANSPORTATION**

**INTEROFFICE MEMORANDUM**

**Utilities Section**



**TO:** Stephen O'Connor, Chief of Contract Administration

**FROM:** Donald Z. Gilman, Utilities Project Supervisor

*Don Gilman*

**DATE:** February 13, 1997

**SUBJECT:** Brandon NH 9619

---

All necessary arrangements have been made for the utility work to be undertaken and completed as required for proper coordination with physical construction schedules, in accordance with 23 C.F.R. 635.307b, with necessary agreements consummated with the appropriate parties concerned.

DZG:mw

cc: Wm. Michael Hedges, Pavement Management Engineer  
Central Files via FCE  
Utility Files via CAW

FEB 18

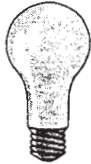
Figure A-25 (continued)

**Utilities—Letters and Special Provisions  
Class 1 Town Highways**

**AGENCY OF TRANSPORTATION**

**INTEROFFICE MEMORANDUM**

**Utilities Section**



**TO:** Stephen O'Connor, Chief of Contract Administration

**FROM:** Donald Gilman, Utilities Project Supervisor *Don Gilman*

**DATE:** February 13, 1997

**SUBJECT:** Brandon NH 9619

---

We forward herein Utility Special Provisions to be incorporated into project documents.

DZG:mw  
Attachment

cc: Wm. Michael Hedges, Pavement Management Engineer  
Construction Division, ATTN: Regional Const. Engr.  
or Resident Engineer  
David Lathrop, DTA #3  
Central Files via FCE  
Utility Files via CAW

*Figure A-25 (continued)*

**Utilities—Letters and Special Provisions  
Class 1 Town Highways**

**BRANDON NH 9619**

**February 13, 1997**

**UTILITY SPECIAL PROVISIONS**

Existing aerial facilities owned by Central Vermont Public Service Corporation and NYNEX are located within the project limits and will not require adjustment. The contractor is cautioned to protect these facilities from damage.

Existing sewer manholes and water system valve boxes owned by the Town of Brandon will be adjusted, as shown on the project plans, by the contractor. The contact person is Bruce Rounds at (802)247-3635.

Existing telephone manholes owned by NYNEX will be adjusted, as necessary, by the Owner. Sufficient notice to the Owner is required to allow for scheduling adjustments. The contact person for NYNEX is Art Peterson at (802)747-1072.

Employees or agents of the above listed utility companies are to be allowed free and full access within the project limits with the tools, material, and equipment necessary to install, operate, maintain, place, replace, relocate, and remove their facilities.

There will be no extra compensation paid to the highway contractor for any inconvenience caused by working around and with the utility companies.

Should the contractor desire additional adjustments of the utility facilities for his/her convenience, proper arrangements shall be made in conformance with Subsection 105.07 of the Standard Specifications for Construction.

Figure A-26

**Invitation for Proposal**



STATE OF VERMONT  
 AGENCY OF TRANSPORTATION  
 133 State Street, Administration Building  
 Montpelier, Vermont 05633-5001



April 01, 1997

Mr. Christopher R. Bean  
 COSTELLO, LOMASNEY & DENAPOLI, INC.  
 540 Commercial Street  
 Manchester, NH 03101

RE:Contract No. 0981832

Dear Mr. Bean:

The Agency of Transportation has identified the paving projects listed below for which we require plans to be developed. Could you provide us with an estimate of the design costs for these projects and a schedule of proposed plan submittal dates. We also require a separate cost breakdown and schedule to provide environmental services on these same projects. In your proposal preparation, please note that our anticipated deadline for all work is July 31, 1998.

Northfield	STP 9731(1)S	VT #12	MM 0.000 - MM 3.058	3.058 mi.
Randolph (Class I TH)	STP 9720(1)S	VT #66	MM 0.000 - MM 0.429	0.429 mi.
Royalton - Tunbridge,	STP 9737(1)S	VT #110	MM 0.000 - MM 1.841	4.161 mi.
Hartland - Hartford,	NH 9726(1)S	US #4	MM 0.503 - MM 8.926	9.196 mi.
-Note 3R requirements on the NH portion of this project				

Woodstock (Class I TH)	STP 9648(1)	VT #106	MM 6.553 - MM 7.233	0.680 mi.
Springfield - Weathersfield	STP 9729(1)	US #5	MM 2.302 - MM 3.987	9.860 mi.

You are not authorized to incur any costs until your estimates and schedules are approved by this office. If your firm is not interested in performing this work, please let me know immediately so that it can be assigned to another company.

Should you have any questions or concerns, I can be reached at (802)828-3578.

Sincerely,

E. Mark D. Woolaver  
 Pavement Design Engineer

cc: PM Consultant File via WMH  
 Mike Pollica, Chief of Audit

Telecommunications Relay Service 1-800-253-0191  
 Vermont is an Equal Opportunity Employer.

Figure A-27

**Notice to Proceed**



STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
133 State Street, Administration Building  
Montpelier, Vermont 05633-5001



April 18, 1997

Mr. Christopher R. Bean, P.E.  
COSTELLO, LOMASNEY & DENAPOLI, INC.  
540 Commercial Street  
Manchester, NH 03101

RE: Contract No. 0981832

Hartland-Hartford,	NH 9726(1)S
Northfield,	STP 9731(1)S
Randolph,	STP 9720(1)S
Royalton-Tunbridge,	STP 9737(1)S
Springfield-Weathersfield,	STP 9729(1)S
Woodstock,	STP 9648(1)S

Dear Mr. Bean:

I have reviewed your April 16, 1997 proposal/cost estimate for the preparation of the environmental documentation for the subject projects and find it acceptable. You are authorized to proceed with environmental services in accordance with the attached and as of this date.

Please call with any questions or concerns. I can be reached at (802) 828-3578.

Sincerely,

E. Mark D. Woolaver  
Pavement Design Engineer

cc: Mike Polica, Chief of Audits  
PM consultant file via WMH

Telecommunications Relay Service 1-800-253-0191

Vermont is an Equal Opportunity Employer.

Figure A-28  
Spreadsheet for Design Work Flow

1997 PAVING PROJECTS FOR THE SUMMER OF 1997 1997											
CON/PM	ROUTE	TOWN(S)	PROJECT NUMBER	BEGIN	END	LENGTH (MILES)	CONSTRUCTION ESTIMATE	BID DATE	LOW BID	CONTR. BID	% DIFF
<b>PAVING PROJECTS ON INTERSTATES</b>											
WM/LSW	I89	COLCHESTER	IM 089-3(29)	91.880	98.000	12.240	1,636,635	08/22/97			
RDS	I89	GEORGIA-FAIRFAX	IM 089-3(26)	106.900	111.000	8.200	9,956,523	07/18/97	7,038,124	Morril	
WM/LSW	I91	SHEFFIELD-BARTON	IM 091-3(9)	150.70	156.00	5.300	760,123				
<b>PAVING PROJECTS ON STATE HIGHWAYS</b>											
CLD/CHF	VT 12A	NORTHFIELD	STP 9462	1.884	4.084	2.200	265,588	05/16/97	1,047,697	Pike	+1.9
CLD/CHF	VT 12A	RANDOLPH-BRAINTREE	STP 9630	0.398	5.187	6.064	1,291,280	05/16/97	Incl Above	Pike	
WM/LSW	VT 104A	GEORGIA-FAIRFAX	STP 9511	0.000	1.165	4.527	612,314	04/25/97	1,177,352	FWW	-6.5
WM/LSW	US 7	MILTON-GEORGIA	STP 9501	5.137	1.103	3.796	386,485	04/25/97	Incl Above	FWW	
WM/LSW	VT 314	SOUTH HERO-GRAND ISLE	STP 9573	0.000	0.710	2.317	235,402	04/25/97	Incl Above	FWW	
WM/LSW	VT 105	ENOSBURG-BERKSHIRE	STP 9505	1.498	3.713	7.383	832,514	05/23/97	965,233	Pike	+2.6
WM/LSW	VT 105	RICHFORD	STP 9510	0.000	1.547	1.547	157,455	05/23/97	Incl Above	Pike	
CEA/LSW	BERLSH	BERLIN(+ One-way)	STP 9515	1.852	2.280	0.882	153,561	07/03/97	879,065	FWW	+24.4
CEA/LSW	VT 62	BERLIN	STP 9666	0.000	1.382	2.763	598,183	07/03/97	Incl Above	FWW	
CHA/LSW	VT 100	GRANVILLE-WARREN	STP 9710	2.971	3.000	9.716	1,190,289	05/09/97	1,166,288	Pike	-2.1
CEA/CHF	VT 14	BARRE TOWN - E MONTP	STP 9452	2.319	0.114	1.828	235,740	04/11/97	248,342	Pike	
CHA/LSW	VT 30	MANCHESTER-DORSET	STP 9603	0.160	0.272	2.897	329,341	05/09/97	1,463,484	Pike	-2.2
CHA/LSW	VT 30	JAMAICA-WINHALL	STP 9519	3.325	2.096	8.900	1,165,910	05/09/97	Incl Above	Pike	
EMJ/CHF	US 7	MIDDLEBURY	NH 9628	5.713	6.426	0.749	110,195	06/20/97	163,644	Pike	+12.0
CHA/CHF	VT 22A	BENSON	STP 9635	0.806	6.276	5.470	1,357,793	06/13/97	2,943,312	Pike	
EMJ/CHF	VT 22A	ORWELL	STP 9633	0.000	3.241	3.241	909,855	06/13/97	Incl Above	Pike	+0.7
EMJ/CHF	VT 22A	WEST HAVEN-BENSON	STP 9634	1.348	0.806	2.465	696,992	06/13/97	Incl Above	Pike	
CLD/CHF	VT 100	STAMFORD-READSBORO	STP 9711	0.000	2.193	7.945	1,047,133	05/02/97	1,173,825	Lane	+12.1
CEA/LSW	VT 114	LYNDON-EAST HAVEN	STP RS 0269(9)	0.000	1.650	10.728	1,486,566	07/11/97	1,826,870	Pike	+11.5
CEA/LSW	US 5	LYNDON	STP 9211	1.865	2.638	0.773	147,807	07/11/97	Incl Above	Pike	
CLD/CHF	VT 106	SPRINGFIELD-WEATHFLD	STP 9461	3.283	2.347	2.862	335,391	05/09/97	1,083,145	Pike	-5.5
CLD/CHF	VT 131	WEATHERSFIELD	STP 9475	1.322	7.965	6.643	809,523	05/09/97	Incl Above	Pike	
CEA/LSW	US 5	BARTON	STP 9713	0.000	3.883	3.883	1,175,731	07/11/97	2,447,649	Pike	Renegot
CEA/LSW	VT 58	BARTON	STP 9401	0.739	3.693	2.954	370,422	07/11/97	Incl Above	Pike	Line
CEA/LSW	VT 14	COVENTRY	STP 9705	0.112	3.700	3.588	400,610	07/11/97	Incl Above	Pike	Prices
GRE/LSW	VT 110	CHELSEA	STP RS 0169(7)	2.787	3.335	0.548	131,778	08/01/97	177,465	Pike	+27.9
CEA/LSW	US 2	CABOT-DANVILLE	NH 9660	5.279	1.735	2.673	462,000	07/25/97	Rejected	Pike	+38.3
CHA/LSW	VT 125	MIDDLEBURY-RIPTON	STP 9740	1.080	5.786		427,247	07/11/97	287,315	F.R. Lafayet	-32.8
CLD/CHF	VT 9	WILMINGTON	STP 9308	1.728	3.090	1.362	292,000	08/14/97			
WM/LSW	US 7	SO. BURLINGTON	NH 9627	0.931	1.648	1.434	873,801	06/20/97	2,949,521	FWW	-2.5
331 PROJECTS				SUBTOTALS		137.878	30,842,187		27,038,331		
<b>PAVING PROJECTS ON CLASS I TOWN HIGHWAYS</b>											
WM/LSW	VT 15	ESSEX JCT	STP 9664	2.249	3.259	1.010	276,979	06/13/97	437,838	FWW	+21.2
CLD/LSW	US 4	HARTFORD	STP 9656	9.354	9.591	0.237	118,889	05/23/97	189,611	FWW	-7.8
GRE/CHF	VT 100	READSBORO	STP 9658	6.547	7.076	0.529	145,896	d / Readvertised		Lane	+27.2
CHA/CHF	US 7	RUTLAND CITY	NH 9609	0.629	1.287	1.316	535,223	07/25/97	641,837	Pike	+19.9
EMJ/CHF	VT 22A	VERGENNES	STP 9649	0.999	1.920	0.921	288,401	07/18/97	462,215	FWW	+17.4
EMJ/CHF	FSH	VERGENNES	STP 9650	0.000	0.663	0.663	106,458	07/18/97	Incl Above	FWW	
EMJ/CHF	VT 116	BRISTOL	STP 9653	6.025	7.250	1.225	294,453	06/20/97	364,728	AC	+24.4
WM/LSW	VT 139	RICHFORD	STP 9663	0.000	1.822	1.822	332,881	08/22/97			
GRE/CHF	US 5	BRATTLEBORO	STP 9643	1.092	2.990	1.898	412,500	08/22/97			
EMJ/CHF	US 7	BRANDON	NH 9619	3.357	4.447	1.090	585,425	06/06/97	308,835	Pike	-47.8
CEA/CHF	US 5	NEWPORT	STP 9651	1.505	3.880	2.375	404,158	d / Readvertised		Pike	+31.5
WM/LSW	US 7	BURLINGTON	NH 9621	0.318	1.243	0.925	2,030,358	06/20/97	Incl w/So. Burl.	FWW	-2.5
12 PROJECTS				SUBTOTALS		14.011	5,531,621		2,405,064		
45 PROJECTS				TOTAL		151.889	36,373,808		29,443,395		



Figure A-28 (continued)  
**Spreadsheet for Design Work Flow**

25-Aug-97

PROJECT NAME	PROJECT NO.	ROUTE NO.	CONSULT NAME	PPMS NO.	BEGIN PROJ.	END PROJ.	LENGTH	GOT CE (REQUEST)	FINAL PLANS			CONTR. PLANS		
									PM	CONSULT	AOT	ADMIN	CONSULT	AOT
Berlin (+ One Way)	STP 9515	BSH	CEA/LSW	93D115	1.852	2.280	0.882	06/03/97	*09/27/96	11/27/96 (R)	12/13/96	05/13/97	12/13/96	05/13/97
Berlin	STP 9666	VT 62	CEA/LSW	95B584	0.000	1.382	2.763	06/03/97	*11/18/96	11/27/96	12/13/96	05/13/97	12/13/96	05/13/97
Chelsea	STP-RS 0168(7)	VT 110	GRE/LSW	89C026	2.787	3.335	0.548	04/04/97	*03/05/97	04/08/97	05/13/97	06/16/97	05/13/97	06/16/97
Enosburg-Berkshire	STP 9505	VT 105	WM/LSW	93B105	1.501	3.700	7.366	04/04/97	*11/14/96	11/25/96	12/19/96	04/11/97	12/19/96	04/11/97
Richford	STP 9510	VT 105	WM/LSW	93B110	0.000	1.547	1.547	04/04/97	*11/14/96	11/25/96	12/19/96	04/11/97	12/19/96	04/11/97
Georgia-Fairfax	STP 9511	VT 104A	WM/LSW	93B111	0.000	1.165	4.527	03/18/97	*10/30/96	11/19/96	12/13/96	03/17/97	12/13/96	03/17/97
Milton-Georgia	STP 9501	US 7	WM/LSW	93C101	5.137	1.103	3.796	03/18/97	*10/30/96	11/19/96	12/13/96	03/17/97	12/13/96	03/17/97
So. Hero-Grand Isle	STP 9573	VT 314	WM/LSW	94C270	0.000	0.710	2.317	03/18/97	*10/30/96	11/19/96	12/13/96	03/17/97	12/13/96	03/17/97
Northfield	STP 9462	VT 12A	CLD/CHF	92C216	1.884	4.084	2.200	01/28/97	*10/15/96	10/24/96	12/02/96	04/02/97	12/02/96	04/02/97
Randolph-Brantree	STP 9630	VT 12A	CLD/CHF	95C072	0.398	5.187	6.064	03/18/97	*10/15/96	10/24/96	12/02/96	04/02/97	12/02/96	04/02/97
Manchester-Dorset	STP 9603	VT 30	CHA/LSW	95B020	0.160	0.272	2.897	03/18/97	*12/18/96	01/03/97	02/01/97	03/18/97	02/01/97	03/18/97
Jamaica-Winnhall	STP 9519	VT 30	CHA/LSW	93B116	3.325	2.096	8.900	03/18/97	*12/18/96	01/03/97	02/01/97	03/18/97	02/01/97	03/18/97
Cabot-Danville	NH 9660	US 2	CEA/LSW	95B132	5.279	1.735	2.673	06/03/97	03/19/97	05/12/97	06/04/97	06/09/97	06/04/97	06/09/97
Barre Town-E. Mntplr	STP 9452	VT 14	CEA/CHF	92B207	2.319	0.114	1.823	01/28/97	*11/25/96	01/19/97	01/30/97	02/19/97	01/30/97	02/19/97
Middlebury	NH 9628	US 7	EMJ/CHF	95B068	5.713	6.426	0.749	04/29/97	*12/09/96	01/15/97	03/14/97	05/09/97	01/15/97	05/09/97
Orwell	STP 9633	VT 22A	EMJ/CHF	95B070	0.000	3.241	3.241	04/29/97	*12/10/96	01/03/96	01/29/97	04/29/97	01/03/96	01/29/97
West Haven-Benson	STP 9634	VT 22A	EMJ/CHF	95B088	1.348	0.806	2.465	04/29/97	*12/10/96	01/03/96	01/29/97	04/29/97	01/03/96	01/29/97
Benson	STP 9635	VT 22A	CHA/CHF	95B082	0.806	6.276	5.470	03/18/97	*10/30/96	11/08/96	01/15/97	04/29/97	11/08/96	01/15/97
Springfld-Whtnsfld	STP 9461	VT 106	CLD/CHF	92C215	3.283	2.347	2.862	01/28/97	*01/22/97	02/20/97	03/19/97	04/02/97	02/20/97	03/19/97
Weathersfield	STP 9475	VT 131	CLD/CHF	92C226	1.322	7.965	6.843	01/28/97	*01/22/97	02/20/97	03/19/97	04/02/97	02/20/97	03/19/97
Barton	STP 9713	US 5	CEA/LSW	96C126	0.000	3.883	3.883	06/03/97	*01/14/97	02/05/97	03/03/97	05/22/97	02/05/97	03/03/97
Barton	STP 9401	VT 58	CEA/LSW	92C159	0.739	3.693	2.954	06/03/97	*01/14/97	02/05/97	03/03/97	05/22/97	02/05/97	03/03/97
Coventry	STP 9705	VT 14	CEA/LSW	96C010	0.112	3.700	3.588	06/03/97	*01/14/97	02/05/97	03/03/97	05/22/97	02/05/97	03/03/97
Lyndon-East Haven	STP-RS 0268(9)	VT 114	CEA/LSW	88C068	0.000	1.650	10.728	06/03/97	*01/29/97	02/27/97	03/24/97	05/20/97	02/27/97	03/24/97
Lyndon	STP 9211	US 5	CEA/LSW	91C131	1.865	2.638	0.773	01/28/97	*01/29/97	02/27/97	03/24/97	05/20/97	02/27/97	03/24/97
Stamford-Readsboro	STP 9711	VT 100	CLD/CHF	96C020	0.000	2.193	7.945	03/18/97	*12/23/96	01/08/97	02/19/97	03/24/97	01/08/97	02/19/97
Granville-Warren	STP 9710	VT 100	CHA/LSW	96B018	2.971	3.000	9.716	03/18/97	*11/25/96	12/10/96	01/02/97	03/24/97	12/10/96	01/02/97
Middlebury-Ripton	STP 9743	VT 125	CHA/LSW	96C336	1.080	5.786	GRAIL	06/03/97	03/27/97	04/18/97	04/28/97	05/12/97	04/18/97	04/28/97
Wilmington	STP 9308	VT 9	CLD/CHF	92B060	1.728	3.090	1.362	<b>No Est</b>	05/08/97	05/29/97	06/23/97	07/03/97	05/29/97	06/23/97
Essex Jct.	STP 9664	VT 15	WM/LSW	95B336	2.249	3.259	1.010	04/04/97	01/09/97	01/30/97	04/11/97	04/30/97	01/30/97	04/11/97
Readsboro	STP 9658	VT 100	GRE/CHF	95C128	6.547	7.076	0.529	04/04/97	01/09/97	01/27/97	03/05/97	04/25/97	01/27/97	03/05/97
Vergennes	STP 9649	VT 22A	EMJ/CHF	95B110	0.999	1.920	0.921	04/29/97	*01/03/96	01/28/97	05/13/97	06/04/97	01/28/97	05/13/97
Vergennes	STP 9650	FSH	EMJ/CHF	95B112	0.000	0.663	0.663	04/29/97	*01/03/96	01/28/97	05/13/97	06/04/97	01/28/97	05/13/97
Bristol	STP 9653	VT 116	EMJ/CHF	95B118	6.025	7.250	1.225	04/29/97	*12/19/96	01/08/97	02/24/97	05/05/97	01/08/97	02/24/97
Richford	STP 9663	VT 139	WM/LSW	95C212	0.000	1.822	1.822	04/04/97	04/10/97	05/29/97	06/17/97	06/25/97	04/10/97	05/29/97
Hartford	STP 9656	US 4	CLD/LSW	95B124	9.354	9.591	0.237	03/18/97	*02/06/97 (R)	02/20/97	03/10/97	04/11/97	02/20/97	03/10/97
Brattleboro	STP 9643	US 5	GRE/CHF	95D098	1.092	2.990	1.898	04/04/97	05/20/97	IN HOUSE	06/25/97	07/03/97	05/20/97	06/25/97
Brandon	NH 9619	US 7	EMJ/CHF	95B052	3.357	4.447	1.090	04/29/97	*02/11/97	03/21/97	04/02/97	04/25/97	03/21/97	04/02/97
Newport	STP 9651	US 5	CEA/CHF	95C114	1.505	3.880	2.375	06/03/97	*03/05/97	04/18/97	05/09/97	06/09/97	03/05/97	05/09/97
Rutland City	NH 9609	US 7	CHA/CHF	95D032	0.829	1.277	0.648	06/18/97	07/12/96	04/25/97	05/12/97	06/06/97	04/25/97	05/12/97
Burlington	STP 9621	US 7/2	WM/LSW	95D056/58	0.000	1.243	1.243	01/31/96	*05/17/96	04/23/97	05/09/97	05/15/97	04/23/97	05/09/97
So. Burlington	NH 9627	US 7	WM/LSW	95B066	0.931	1.738	0.807	03/18/96	*03/04/96	04/23/97	05/09/97	05/15/97	04/23/97	05/09/97

*Figure A-29*  
**Plan Sheets**

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# STATE OF VERMONT AGENCY OF TRANSPORTATION



## PROPOSED IMPROVEMENTS TOWN OF BERLIN COUNTY OF WASHINGTON

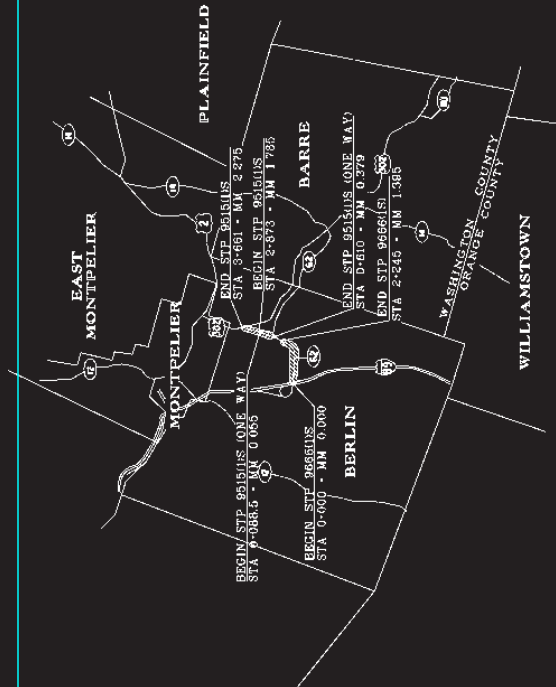
BERLIN STATE HIGHWAY  
& ONE WAY SECTION  
STP 9515(0)S

BERLIN  
VT ROUTE 62  
STP 9666(0)S

SEE SHEET 13 OF 25

SEE SHEET 5 OF 25

PROJECT LOCATION  
STP 9515(0)S, STP 9666(0)S



**CONVENTIONAL SIGNS**

COUNTY LINE	
TOWN LINE	
POINT OF ACCESS	
FENCE LINE	
TRAVELED WAY	
GUARD RAIL	
RAILROAD	
ADJACENT LINE	
POWER POLE	
TREES	
CONTROL OF ACCESS	
PROPERTY LINE	
PLANK TRAIN'S	
TOP OF DIRT	
TOE OF SLOPE	

BY:

CIVIL ENGINEERING ASSOCIATES, INC.  
60 HICKMAN, VERMONT

DATUM	N/A
VERTICAL	N/A
HORIZONTAL	N/A

THESE PLANS ARE SUBJECT TO SUCH ENGINEERING CHANGES AS MAY BE REQUIRED BY THE FEDERAL HIGHWAY ADMINISTRATION OR THE DIRECTOR OF CONSTRUCTION AND MAINTENANCE. CONSTRUCTION IS TO BE CARRIED OUT IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR HIGHWAYS FOR CONSTRUCTION DATED 1988, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON AUGUST 21, 1995 FOR USE ON THIS PROJECT INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

RIGHT-OF-WAY LIMITS, IF APPLICABLE, ARE PROVIDED SOLELY FOR THE CONVENIENCE OF THE STATE AND ITS CONTRACTORS, AND ARE NOT TO BE USED FOR ANY OTHER PROJECT, ANY REPRESENTATIONS TO EFFECT TO THESE PLANS ARE APPROXIMATE AND SHOULD NOT BE RELIED UPON FOR ANY OTHER PURPOSES. UNLESS OTHERWISE NOTED, ALL DRAWINGS AND DETAILS ON THESE PLANS ARE DRAWN "NOT TO SCALE".



APPROVED	DATE
DIRECTOR OF CONSTRUCTION & MAINTENANCE	
DEPARTMENT OF TRANSPORTATION	
FEDERAL HIGHWAY ADMINISTRATION	
APPROVED	DATE
DIVISION ADMINISTRATOR	
PROJECT	TOWN OF BERLIN
	STP 9515(0)S, STP 9666(0)S
	SHEET 1 OF 23 SHEETS

/s/eric.f.ross@vt.gov

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 02 COMPOSITE INDEX OF SHEETS  
 03 COMPOSITE QUANTITY SHEET  
 04 BLANK

BERLIN - BERLIN STATE HIGHWAY & ONE WAY SECTION OF 66H STP 9656113S

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 07 QUANTITY SHEET  
 08 PLAN SUMMARY SHEET  
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BERLIN - VT ROUTE 62 STP 9656113S  
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DESIGNED BY	REVISED	DATE
DRAWN BY	E.C.A.	DATE
DESIGN FILE NO.	/pavm/0309/0966113	
FILE	PERSON	DATE PLOTTED
PROJECT	BERLIN	
PROJ. NO.	STP 9656113S, 9666113S	
SHEET	2	OF 25 SHEETS

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DATE	REVISED
VERTICAL	N/A
HORIZONTAL	N/A

# STATE OF VERMONT AGENCY OF TRANSPORTATION

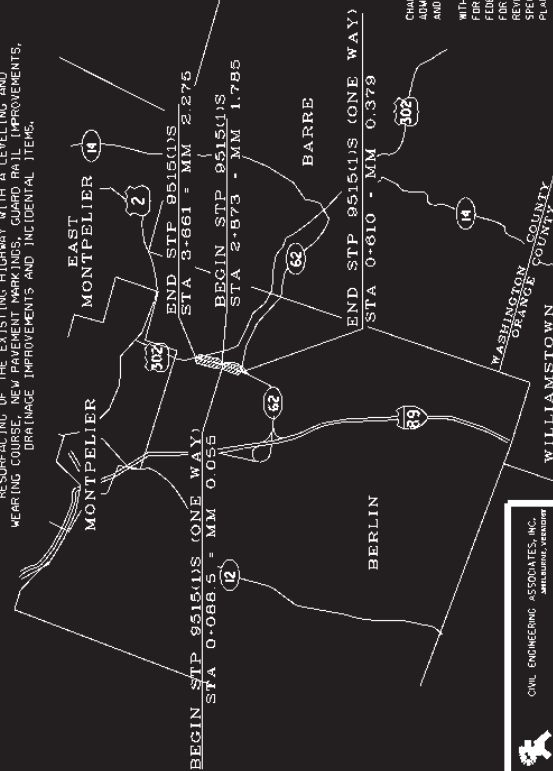


## PROPOSED IMPROVEMENTS TOWN OF BERLIN COUNTY OF WASHINGTON & BERLIN STATE HIGHWAY & ONE WAY SECTION OF THE BSH

BEGINNING AT STATION 2+873 (MM 1.785) ON THE BERLIN STATE HIGHWAY (BSH) AT THE INTERSECTION OF THE ONE WAY ONLY SECTION AND EXTENDING EASTERLY ALONG THE BSH FOR A DISTANCE OF 521.5 METERS (0.324 MILES) TO THE INTERSECTION OF THE BSH AND THE ONE WAY ONLY SECTION OF THE BSH, STA 0+000.0 (MM 0.000) TO STA 2+275 (MM 1.785) ON THE BSH, STA 0+000.0 (MM 0.000) AND EXTENDING WESTERLY FOR A DISTANCE OF 521.5 METERS (0.324 MILES) TO THE INTERSECTION OF VT \*62, STA 0+810 (MM 0.379) TO STATION DATA.

STATION TO STATION DATA	LENGTH (METERS)	(MILES)
BERLIN STATE HIGHWAY STA 2+873 (MM 1.785) TO STA 3+661 (MM 2.275)	788	0.490
ONE WAY ONLY SECTION STA 0+000.0 (MM 0.000) TO STA 0+810 (MM 0.379)	521.5	0.324
<b>PROJECT TOTALS</b>	<b>1309.5</b>	<b>0.814</b>

WORK TO BE PERFORMED UNDER THIS PROJECT INCLUDES RESURFACING OF THE EXISTING HIGHWAY WITH A LEVELING AND WEARING COURSE, NEW BENCH MARKS, ROAD PAINT IMPROVEMENTS, BRIDGE IMPROVEMENTS AND INCIDENTAL ITEMS.



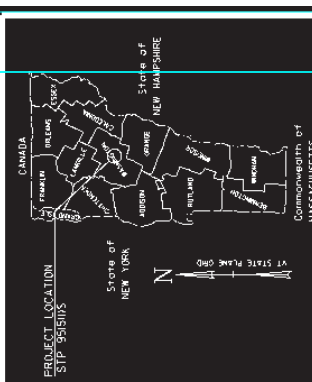
CIVIL ENGINEERING ASSOCIATES, INC.  
JERICHO, VERMONT

DATUM	N/A
VERTICAL	N/A
HORIZONTAL	N/A

CONVENTIONAL SIGNS	SYMBOL
COUNTY LINE	---
TOWN LINE	- - - -
POINT OF ACCESS	X
FRIDGE LINE	
STONE WALL	=====
TRAVELED WAY	=====
RAILROAD	====+====
SEWER LINE	
POWER POLE	⊕
TREES	⊕
CONTROL OF ACCESS	---
PROPERTY LINE	---
ROAD MARKING LINE	---
TOP OF DENTS	○
TOE OF SLOPE	○

INDEX OF SHEETS  
SEE SHEET 2 OF 25

VADT STANDARDS  
SEE SHEET 2 OF 25



TRAFFIC DATA  
1987 ADT = 6258  
1987 DRV = 810  
2007 ADT = 7288  
2007 DRV = 910  
1997 - 2007 CUM. ESALS = 1,058,000

RIGHT-OF-WAY LIMITS, IF APPLICABLE, ARE PROVIDED SOLELY FOR THE CONVENIENCE OF THE STATE AND ITS AGENCIES. UNDER NO CIRCUMSTANCES SHALL THESE PLANS BE APPROXIMATE AND SHOULD NOT BE RELIED UPON FOR ANY OTHER PURPOSES.  
UNLESS OTHERWISE NOTED, ALL DRAWINGS AND DETAILS ON THESE PLANS ARE DRAWN NOT TO SCALE.



APPROVED	DATE
DIRECTOR OF CONSTRUCTION & MAINTENANCE	
APPROVED	DATE
DIRECTOR OF TRANSPORTATION	
APPROVED	DATE
DIVISION ADMINISTRATOR	
PROJECT	
BERLIN	
STP 051511S	
SHEET 3 OF 23	SHEETS

**NOTES**

1. THE PAVEMENT WEARING COURSE SHALL BE TYPE III. THE LEVING COURSE SHALL BE TYPE IV UNLESS OTHERWISE NOTED. THE WEARING COURSE SHALL BE PLACED AND FINISHED TO THE PROPER GRADE AND FINISH. THE LEVING COURSE SHALL BE PLACED AND FINISHED TO THE PROPER GRADE AND FINISH. THE WEARING COURSE SHALL BE PLACED AND FINISHED TO THE PROPER GRADE AND FINISH. THE LEVING COURSE SHALL BE PLACED AND FINISHED TO THE PROPER GRADE AND FINISH.
2. EMULSION ASPHALT SHALL BE APPLIED ON EXISTING PAVEMENT SURFACES, BETWEEN ALL COURSES OF PAVEMENT AND ON ALL COLD PLANE JOINTS AT THE RATE OF 0.45 LBS/SY OR AS DIRECTED BY THE ENGINEER.
3. BITUMINOUS CONCRETE PAVEMENT TO LEAVENE ± 5 mm TOTAL THICKNESS EXCLUDING LEVING.
4. COLD PLANE JOINTS TO BE COMPLETED ACCORDING TO THE TYPICAL OR AS NOTED OTHERWISE ON THE PLANS. SEE SHEET 02.
5. ITEMS 604-402, 604-403, 604-404 ARE ESTIMATED QUANTITIES AND SHALL BE ADJUSTED AS DIRECTED BY THE RESIDENT ENGINEER.
6. ALL TREATED TIMBER CURB SHALL BE BACKED UP FULL HEIGHT WITH ITEM 602-22; APPROPRIATE DIMENSIONS AS DIRECTED BY THE RESIDENT ENGINEER.

**CONSERVATION SEED MIX**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
1	SEED MIX	10000	KG
2	WATER	10000	L
3	CEMENT	10000	KG
4	AGGREGATE	10000	KG
5	ADDITIONAL AGGREGATE	10000	KG
6	ADDITIONAL AGGREGATE	10000	KG
7	ADDITIONAL AGGREGATE	10000	KG
8	ADDITIONAL AGGREGATE	10000	KG
9	ADDITIONAL AGGREGATE	10000	KG
10	ADDITIONAL AGGREGATE	10000	KG

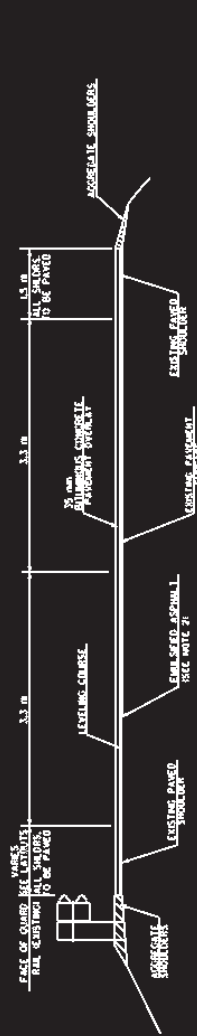
1. SEED MIXTURE SHALL NOT HAVE A WEAR COURSE EXCEEDING 0.005 BY WEIGHT AND SHALL BE FREE OF ALL HARMFUL SEEDS.
2. SEED MIXTURE SHALL BE APPLIED PER SEEDING FORMULAS OR AS DIRECTED BY THE ENGINEER.
3. SEED MIXTURE SHALL BE USED WITH SEEDS, APPLIED AT THE RATE OF 4.5 TONS/STRUCTURE, HYDRO SEEDERS MAY USE 10-15% MORE SEED.
4. SEED MIXTURE SHALL BE USED WITH SEEDS, APPLIED AT THE RATE OF 4.5 TONS/STRUCTURE, OR AS DIRECTED BY THE ENGINEER.
5. SEED MIXTURE SHALL BE USED WITH SEEDS, APPLIED AT THE RATE OF 4.5 TONS/STRUCTURE, OR AS DIRECTED BY THE ENGINEER.
6. SEED MIXTURE SHALL BE USED WITH SEEDS, APPLIED AT THE RATE OF 4.5 TONS/STRUCTURE, OR AS DIRECTED BY THE ENGINEER.



DESIGNED BY	DATE
DRAWN BY	DATE
CHECKED BY	DATE
IN CHARGE	DATE
PROJECT NO.	DATE
PROJ. NAME	DATE
PROJ. NO.	DATE
SHEET NO.	DATE

**PROJECT TYPICAL SHEET**

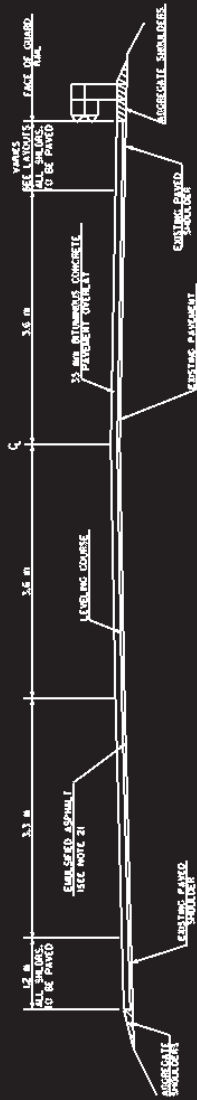
**ONE WAY SECTION - BSH**



**OVERLAY TYPICAL SECTION**

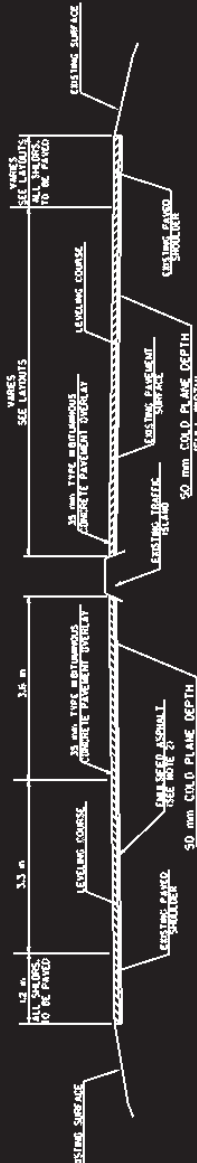
STA 0+088.5 TO 0+610

**BERLIN STATE HIGHWAY (BSH)**



**OVERLAY TYPICAL SECTION**

STA 2+873 TO 3+599



**COLD PLANE TYPICAL SECTION**

STA 3+581 TO 3+661

**PROJECT PAVING LIMITS**

TOWN & ROUTE	BEGIN STATION	END STATION	LANE TYPICAL	WEARING DEPTH	LEVELING TYPICAL	NOTES
BERLIN - ONE WAY SECTION - BSH	0+088.5	0+610	3.3-3.6	35 mm	50 mm	ONE-WAY SECTION
BERLIN - BERLIN STATE HIGHWAY	2+873	3+599	3.6	35 mm	50 mm	
BERLIN - BERLIN STATE HIGHWAY	3+581	3+661	3.6	35 mm	50 mm	

APPROXIMATE SUMMARY OF QUANTITIES			DETAILED SUMMARY OF QUANTITIES			DETAILED SUMMARY OF QUANTITIES						
R.O.N.	NON-GOV'T PARTICIPATING	GOV'T PARTICIPATING	QUANTITIES (from total)	UNIT	ITEMS	ITEM ID.	QUANTITIES	UNIT	ITEMS	QUANTITIES	UNIT	ITEMS
	1.45	1.45	1.45	CM	EARTH BORROW	203.30	1.45					
				CM	TRENCH EXCAVATION OF EARTH (N.A.B.L.)	204.20						
		1725	1725	SM	COLD PLANKING - BITUMINOUS PAVEMENT	210.10						
	2	2	2	T	SUBBASE OF CRUSHED GRAVEL (FINE DROGGED)	301.28						
	60	60	60	T	AGGREGATE SHOULDERS	402.12						
	2350	2350	2350	KG	EMULSIFIED ASPHALT	404.85						
	2075	2075	2075	T	BITUMINOUS CONCRETE PAVEMENT (60, 54-20)	405.25						
	0.3	0.3	0.3	L.S.	PARTIAL CURB (GENERAL CEMENT (N.A.B.L.))	405.50						
	2	2	2	EA	REHABILITATION OF O.I. CB OR MH. CLASS I	604.412						
	1	1	1	EA	REHABILITATION OF O.I. CB OR MH. CLASS II	604.415						
	20	20	20	HR	POWER SHOVEL RENTAL	604.418						
	10	10	10	HR	FRONT ENDER RENTAL	608.42						
	20	20	20	HR	TRUCK RENTAL	608.37						
	20	20	20	HR	LOADER RENTAL (TYPE I)	608.40						
	340	340	340	M	TREATED TIMBER CURB	616.35						
	748	748	748	M	STEEL BEAM CURB	621.20						
	4	4	4	EA	PROTECTED ROUND UNDER TERMINAL	621.20						
	250	250	250	M	REMOVAL AND DISPOSAL OF ROAD BAIL	621.80						
	180	180	180	HR	UNFLAGGED TRAFFIC OFFICERS (N.A.B.L.)	630.10						
	400	400	400	HR	FLAGGERS (N.A.B.L.)	630.15						
	0.3	0.3	0.3	L.S.	FIELD OFFICE - LOW SPEEDS	631.10						
	0.3	0.3	0.3	L.S.	FIELD OFFICE - HIGH SPEEDS	631.15						
	0.3	0.3	0.3	L.S.	TESTING EQUIPMENT - BITUMINOUS	631.19						
	0.3	0.3	0.3	L.S.	FIELD OFFICE TELEPHONE (N.A.B.L.)	631.24						
	0.3	0.3	0.3	L.S.	MOBILIZATION	635.10						
	2550	2550	2550	M	DURABLE 100 MM WHITE LINES	645.40						
	2250	2250	2250	M	DURABLE 100 MM YELLOW LINES	645.41						
	50	50	50	M	DURABLE 200 MM YELLOW LINES	645.43						
	6	6	6	M	DURABLE 600 MM SIGN	645.46						
	31	31	31	EA	DURABLE LETTER OR SYMBOL	645.40						
	2550	2550	2550	M	TEMPORARY 100 MM WHITE LINE	645.60						
	2250	2250	2250	M	TEMPORARY 100 MM YELLOW LINE	645.61						
	50	50	50	M	TEMPORARY 200 MM YELLOW LINE	645.63						
	8	8	8	M	TEMPORARY 500 MM STOP BAR	645.65						
	31	31	31	EA	TEMPORARY LETTER OR SYMBOL	645.70						
	250	250	250	EA	LINE STRIPING TARGETS	645.75						
	70	70	70	M	PAINTED CURB	645.81						
	15	15	15	KG	SEED	651.15						
	115	115	115	KG	FERTILIZER	651.18						
				T	AGGREGATE LIMESTONE	651.20						
				T	HRY M/LCH	651.20						
	20	20	20	CM	TOPSOIL	651.25						
	4.55	4.55	4.55	SM	TRAFFIC SIGNS, TYPE A	675.20						
					- BEGIN OPTION ITEMS -							
	95	95	95	KG	FLANGED CHANNEL SIGN POSTS	675.30						
	95	95	95	KG	SQUARE TUBE STEEL POSTS AND ANCHORS	675.34						
					- END OPTION ITEMS -							
	4	4	4	EA	RECYCLING SIGNS	675.40						

STATIONS FROM TO EQUATIONS METERS KILOMETERS REMARKS

PROJECT NAME: REBILIN  
PROJECT NUMBER: STP 9315015  
QUANTITY SHEET

101415

10/14/15

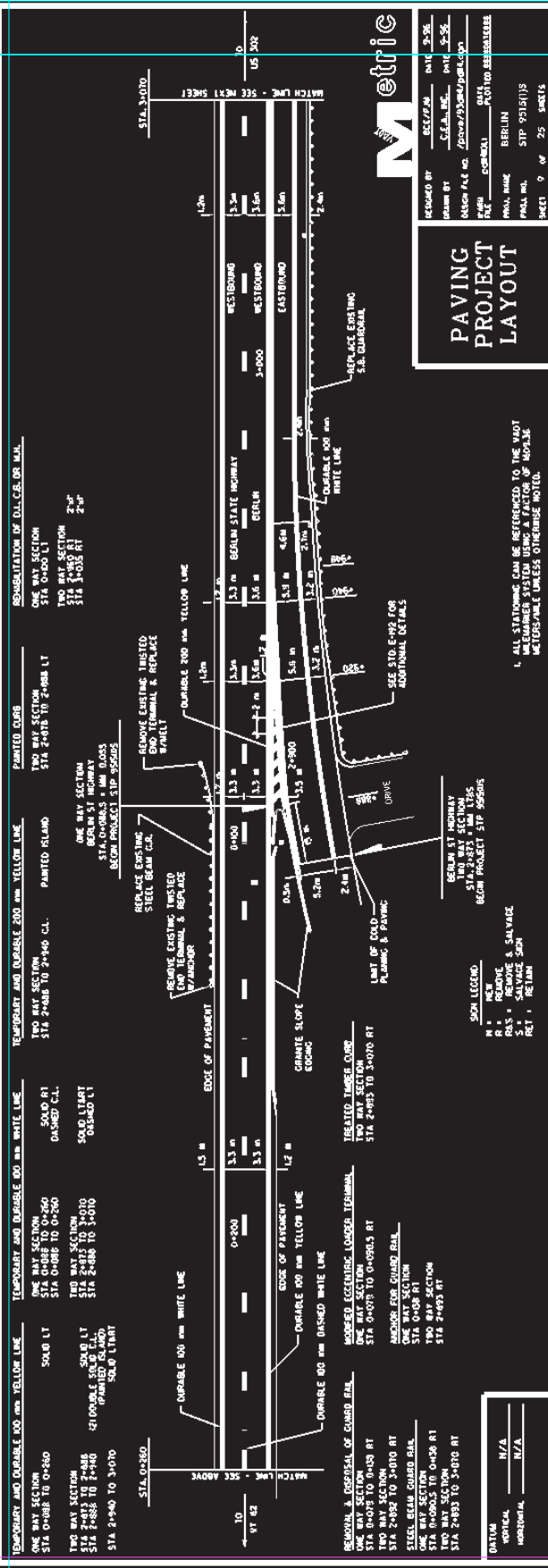
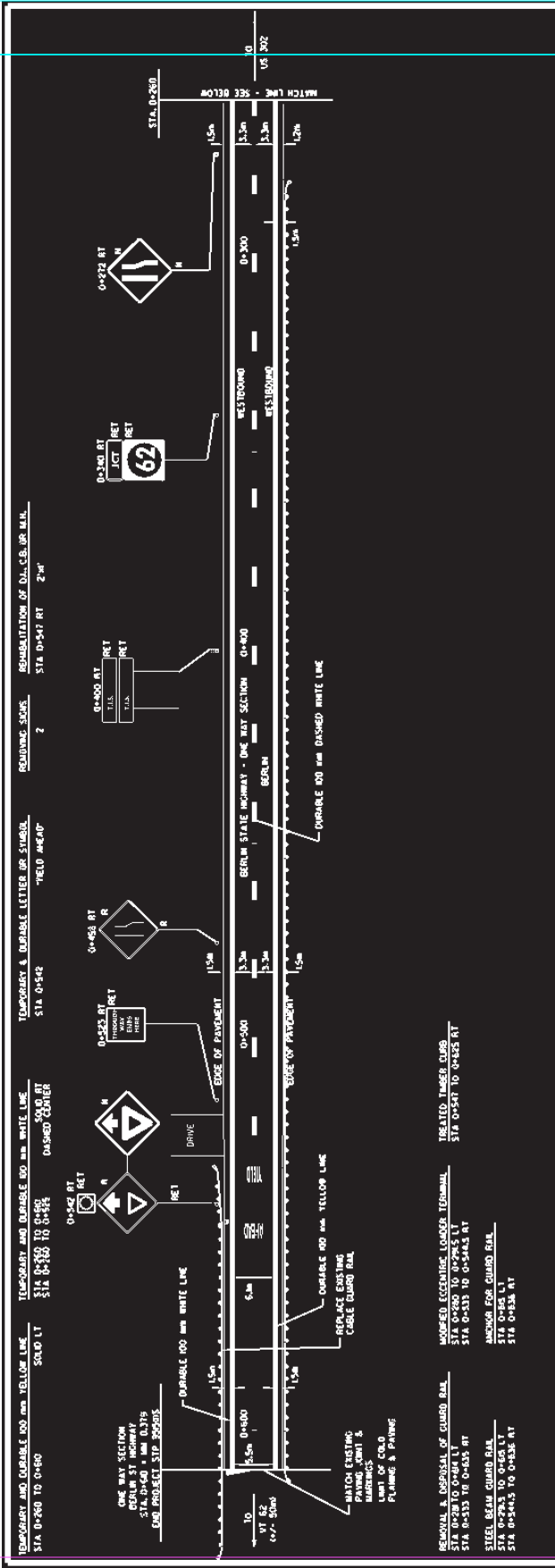
06/14/11

/power/vermont.com

SHEET 7 OF 25 SHEETS







**Metric**

DESIGNED BY: BCL/22/M DATE: 9.96  
 DRAWN BY: C.E.A./M DATE: 5.96  
 DESIGN FILE NO.: 2004/235/PAVING  
 PROJECT NO.: 0111  
 PROJECT NAME: 011100 BERLIN/LESLIE  
 PROJECT NO.: 011100 BERLIN/LESLIE  
 PROJECT NAME: 011100 BERLIN/LESLIE  
 PROJECT NO.: 011100 BERLIN/LESLIE  
 PROJECT NAME: 011100 BERLIN/LESLIE

## PAVING PROJECT LAYOUT

1. ALL STATIONING CAN BE REFERENCED TO THE ADJUTANT GENERAL SYSTEM USING A FACTOR OF 0.9144 METERS/PAVE UNLESS OTHERWISE NOTED.

SEE STIP 0-492 FOR ADDITIONAL DETAILS

BERLIN ST HIGHWAY STA 2+873.45 TO 2+873.45  
 BERLIN PROJECT STIP 559505

SON LEGEND:  
 R = REMOVE  
 RS = REMOVE & SALVAGE  
 RET = RETAIN

REMOVE & DISPOSAL OF GUARD RAIL  
 STA 2+873 TO 2+873 RT  
 TWO WAY SECTION  
 STA 2+892 TO 2+892 RT  
 STEEL BEAM GUARD RAIL  
 ONE WAY SECTION  
 STA 2+892 TO 2+892 RT  
 TWO WAY SECTION  
 STA 2+892 TO 2+892 RT

REMOVE EXISTING LOWER TERMINAL  
 STA 0+492 TO 0+492 RT  
 ANCHOR FOR GUARD RAIL  
 ONE WAY SECTION  
 STA 0+492 TO 0+492 RT  
 TWO WAY SECTION  
 STA 0+492 TO 0+492 RT

REMOVE EXISTING LOWER TERMINAL  
 STA 0+492 TO 0+492 RT  
 ANCHOR FOR GUARD RAIL  
 ONE WAY SECTION  
 STA 0+492 TO 0+492 RT  
 TWO WAY SECTION  
 STA 0+492 TO 0+492 RT

REMOVE EXISTING LOWER TERMINAL  
 STA 0+492 TO 0+492 RT  
 ANCHOR FOR GUARD RAIL  
 ONE WAY SECTION  
 STA 0+492 TO 0+492 RT  
 TWO WAY SECTION  
 STA 0+492 TO 0+492 RT

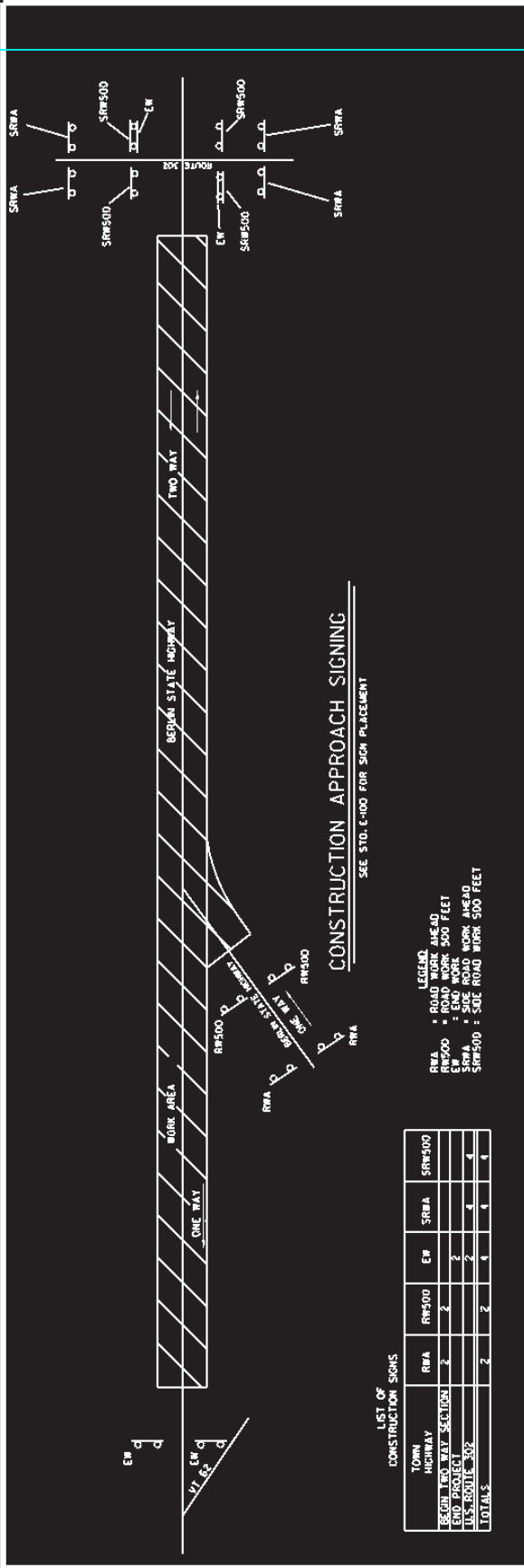
TEMPORARY AND DURABLE 100 mm YELLOW LINE  
 STA 0+260 TO 0+480  
 TEMPORARY AND DURABLE 100 mm WHITE LINE  
 STA 0+260 TO 0+480  
 TEMPORARY AND DURABLE 200 mm YELLOW LINE  
 STA 0+260 TO 0+480  
 TEMPORARY AND DURABLE 100 mm DASHED WHITE LINE  
 STA 0+260 TO 0+480

TEMPORARY AND DURABLE 100 mm WHITE LINE  
 STA 0+480 TO 0+500  
 TEMPORARY AND DURABLE 200 mm YELLOW LINE  
 STA 0+480 TO 0+500  
 TEMPORARY AND DURABLE 100 mm DASHED WHITE LINE  
 STA 0+480 TO 0+500

TEMPORARY AND DURABLE 100 mm WHITE LINE  
 STA 0+500 TO 0+800  
 TEMPORARY AND DURABLE 200 mm YELLOW LINE  
 STA 0+500 TO 0+800  
 TEMPORARY AND DURABLE 100 mm DASHED WHITE LINE  
 STA 0+500 TO 0+800

TEMPORARY AND DURABLE 100 mm WHITE LINE  
 STA 0+800 TO 0+800  
 TEMPORARY AND DURABLE 200 mm YELLOW LINE  
 STA 0+800 TO 0+800  
 TEMPORARY AND DURABLE 100 mm DASHED WHITE LINE  
 STA 0+800 TO 0+800





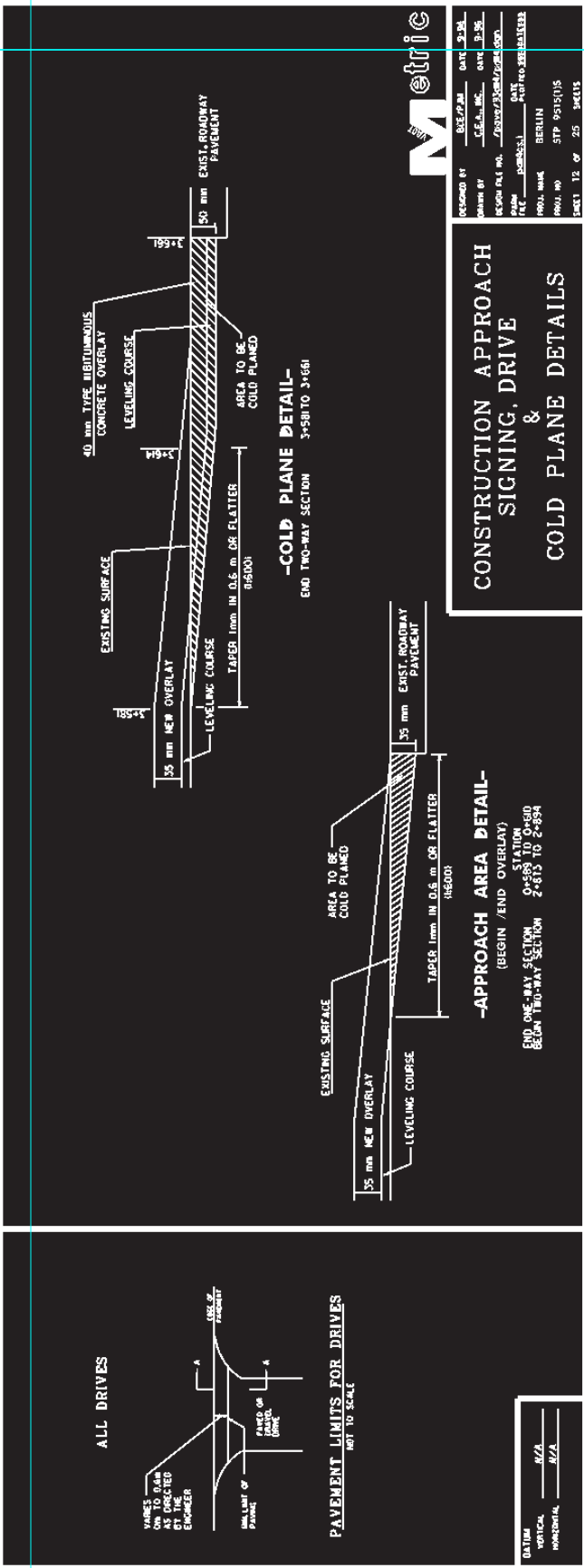
**CONSTRUCTION APPROACH SIGNING**

SEE STD. E-100 FOR SIGN PLACEMENT

**LIST OF CONSTRUCTION SIGNS**

TOWN	RWA	RW500	EW	SRWA	SRW500
BEGIN TWO-WAY SECTION	2	2	2	2	2
END PROJECT	2	2	2	2	2
U.S. ROUTE 202	2	2	2	2	2
TOTALS	2	2	2	2	2

- LEGEND**
- RWA : ROAD WORK AHEAD
  - RW500 : ROAD WORK 500 FEET
  - EW : END WORK 500 FEET
  - SRWA : SIDE ROAD WORK AHEAD
  - SRW500 : SIDE ROAD WORK 500 FEET



DESIGNED BY: BEE/200 DATE: 3-20  
 DRAWN BY: G.E.H./MS DATE: 3-20  
 CHECKED BY: J.S.P./MS DATE: 3-20  
 PROJECT NO.: 2000/388/2000  
 DRAWING NO.: 2000/388/2000  
 PROJECT NAME: BERKMAN STATE HIGHWAY  
 SHEET NO.: STP 951515  
 TOTAL SHEETS: 25

**CONSTRUCTION APPROACH SIGNING & COLD PLANE DETAILS**

**-APPROACH AREA DETAIL-**

(BEGIN /END OVERLAY)  
 END ONE-WAY SECTION 0+593 TO 0+590  
 BELOW TWO-WAY SECTION 2+615 TO 2+618

**ALL DRIVES**



**PAVEMENT LIMITS FOR DRIVES**  
 NOT TO SCALE

DATUM	VERTICAL	1/2"
	HORIZONTAL	1/2"

# STATE OF VERMONT AGENCY OF TRANSPORTATION



## PROPOSED IMPROVEMENTS TOWN OF BERLIN COUNTY OF WASHINGTON VT ROUTE 62

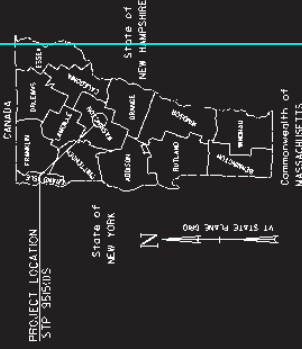
INDEX OF SHEETS  
SEE SHEET 2 OF 25

VAOT STANDARDS  
SEE SHEET 2 OF 25

BEGINNING AT STATION 0+000 MM 0.0000 ON VT ROUTE 62 AT INTERCHANGE 7 OF INTERSTATE 89 AND EXTENDING 2+245 MM 1.3950 TO THE INTERSECTION WITH AIRPORT ROAD

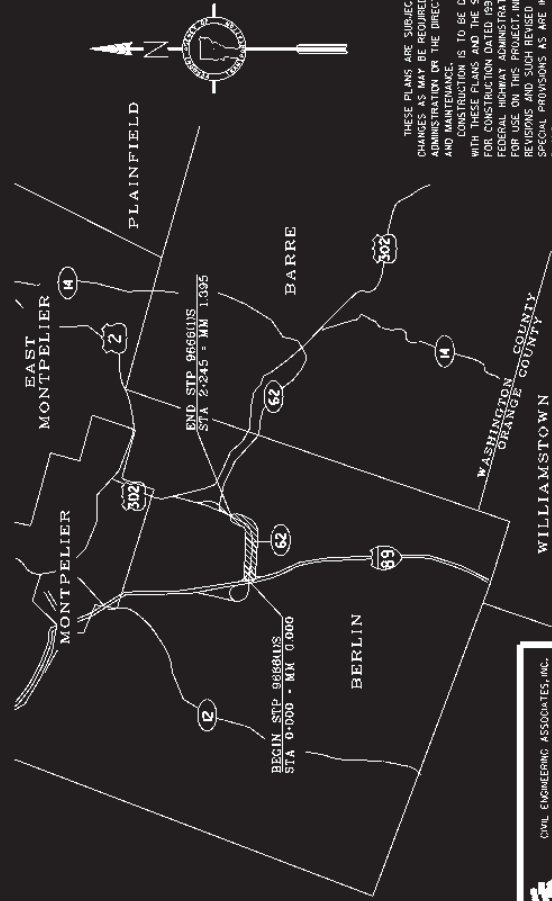
STATION TO STATION DATA	TOWN OF BERLIN	METERS	LENGTH	(MILES)
STA. 0+000 MM 0.0000 TO STA. 2+245 MM 1.3950		2245	1.395	

WORK TO BE PERFORMED UNDER THIS PROJECT INCLUDES COLD MIX RECYCLING AND PAVING OF THE EXISTING ROADWAY WITH 1.5" ASPHALT SURFACE. DRAINAGE IMPROVEMENTS AND INCIDENTAL ITEMS.



**TRAFFIC DATA**

1987 ADT = 03310  
 1987 DMV = 1815  
 2007 ADT = 40800  
 2007 DMV = 1225  
 1997 \*2007 ESALS (ELX18R1.1) = 3,639,600



**CONVENTIONAL SIGNS**

COUNTY LINE	---
STATE LINE	---
RIGHT OF WAY LIMITS OF ACCESS	---X---
POINT OF ACCESS	X---
FENCE LINE	---X---
STONE WALL	-----
TRAVELED WAY	=====
RAILROAD	====+====
RAILROAD CROSSING	---X---
CULVERT	---X---
POWER POLE	○
TELEPHONE POLE	⊕
TREES	⊕
CONTROL OF ACCESS	---/---
PROPERTY LINE	---
ROAD MARKING LINE	---
TOP OF CUT	---A---
TOP OF DIRT	---D---
TOP OF SLOPE	---O---

DATUM	N/A
VERTICAL	N/A
HORIZONTAL	N/A

CIVIL ENGINEERING ASSOCIATES, INC.  
 Shelburne, Vermont

THESE PLANS ARE SUBJECT TO SUCH ENGINEERING CHANGES AS MAY BE REQUIRED BY THE FEDERAL HIGHWAY ADMINISTRATION OR THE DIRECTOR OF CONSTRUCTION AND MAINTENANCE. CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR HIGHWAYS FOR CONSTRUCTION DATED 1983 AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON AUGUST 21, 1995 FOR USE ON THIS PROJECT INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

pas884113 / 06av75b3b4/06b384d901

RIGHT-OF-WAY LIMITS, IF APPLICABLE, ARE PROVIDED SOLELY FOR THE CONVENIENCE OF THE STATE AND ITS AGENCIES. THE LOCATION OF THE RIGHT-OF-WAY LIMITS PROJECT, ANY REFERENCES TO OFFSETS ON THESE PLANS ARE APPROXIMATE AND SHOULD NOT BE RELED UPON FOR ANY OTHER PURPOSES. UNLESS OTHERWISE NOTED, ALL DRAWINGS AND DETAILS ON THESE PLANS ARE DRAWN "NOT TO SCALE".



APPROVED	DATE
DIRECTOR OF CONSTRUCTION & MAINTENANCE	
DEPARTMENT OF TRANSPORTATION	
FEDERAL HIGHWAY ADMINISTRATION	
APPROVED	DATE
DIVISION ADMINISTRATOR	
PROJECT	
BERLIN	
STP 0606015	
SHEET 13 OF 23	SHEETS







# ITEM DETAIL SUMMARY SHEET

LOCATION	MISCELLANEOUS ITEMS															DRAINAGE ITEMS					NEW PIPE					GUMB RAIL ITEMS						REMARKS
	203.16	203.16	203.20	204.21	301.22	016.28	016.30	016.40	016.47	016.10	000.40	000.41	000.415	000.415	600.418	521.20	521.20	521.20	521.20	521.54	521.54	521.75	521.75	521.80								
STA	203.16	203.16	203.20	204.21	301.22	016.28	016.30	016.40	016.47	016.10	000.40	000.41	000.415	000.415	600.418	521.20	521.20	521.20	521.20	521.54	521.54	521.75	521.75	521.80								
FOC	COIL EXCAV.	ROCK EXCAV.	TRENCH EXCAV.	TRENCH EXCAV.	WENCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.	REINCH EXCAV.								
	CM	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA	CA								
	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT								
	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT								
	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT	LT								
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1								
20300	2-245	1-181																														
20300	2-245	1-181																														
20305	0-455	BT																														
20305	0-455	BT																														
20305	0-448	LT																														
20305	0-413	LT																														
20307	0-280	C-1																														
20305	0-450	RT																														
20309	0-270	C-1																														
20320	1-425	RT																														
20325	1-489	LT																														
20328	2-402	RT																														
20326	2-227	LT																														
SHEET REVISIONS																																
SHEET TOTALS																																

**ITEM  
DETAIL  
SHEET**

DRAWING BY: B. J. B. 0-11-88  
 DRAWING NO: 8-17-88  
 PROJECT NO: 100001/001/001/001/001  
 DATE: 01-11-88  
 DRAWN BY: J. B. B. 0-11-88  
 CHECKED BY: J. B. B. 0-11-88  
 PROJECT NAME: BERLIN  
 SHEET NO: STP 6666(1)S  
 SHEET 16 OF 25 SHEETS





Figure A-30

**Standard Drawing Index**

STANDARD DRAWINGS INDEX

May 27, 1997

A-1	4-Lane, Standard Median	06-16-82
A-2	4-Lane, Variable Median	06-16-82
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A-7	Two-Way Ramp	04-02-86
A-21	Class 3 Town Highways, ADT 0-250	06-17-82
A-22	Class 3 Town Highways, ADT 250-400	06-17-82
A-23	Other Than Class 3 ADT 0-400	04-02-86
A-24	All ADT 400-750	04-02-86
A-25	All ADT 750 + <50 mph	04-02-86
A-26	All ADT 750 + > Or = 50 mph	04-02-86
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A-37	Initial, 2-Lane, Ultimate, 4 Lane, Std. Median	06-16-82
A-38	Initial, 2-Lane, Ultimate, 4-Lane, Var. Median	06-16-82
A-40	Stage II & III Const., 4-lane Std. Median	06-16-82
A-41	Stage II & III Const., 4-Lane Var. Median	06-16-82
A-42	Stage II & III Const., One-Way Ramp	06-16-82
A-43	Stage II & III Const., Two-Way Ramp	04-02-86
A-60	Slopes in Solid Rock Excav. (50 mph & over)	06-01-94
A-61	Slopes in Solid Rock Excav. (Under 50 mph)	06-01-94
A-62	Slopes in Solid Rock Excav. (400 vpd & over)	06-30-95
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A-76	Standard For Development Roads	03-10-95
A-77	Bicycle Lanes	03-18-75
B-1	Banking Tables	06-01-94
B-5	Slope Grading, Embankments, Muck	06-01-94
B-11	Underdrain - Rock Subgrade, Slope Stabiliz.	06-01-94
B-12	Side Road Intersection, Depressed Ramp	06-01-94
B-17	Guard Rail, Bridges, Rest Area, Turnouts	02-23-95
B-71	Residential and Commercial Drives	03-10-95
C-1	Curbs, Bituminous Concrete Sidewalks, Granite Slope Edging, Vertical Granite Curb, Precast Reinforced Concrete Curb, Cast-in-Place Concrete Curb, Bituminous Concrete Curb, Treated Timber Curb	06-01-94
C-2A	Cement Concrete Sidewalk, Concrete Curb	06-01-94
C-2B	Cement Concrete Sidewalk, Granite Curb	06-01-94
C-3	Sidewalk Ramps	06-01-94
D-1	Precast RCP Drop Inlet, Reinforced Concrete Pipe D.I. w/Cast Iron Gate, Reinforced Concrete Pipe D.I. w/Concrete Cover	06-01-94
D-2	C.R.M. Headwalls, Underdrain, C.R.M. Headwalls & Retaining Walls, RIPRAP Light Type Slope Headwall, Reinforced Concrete Headwall, Underdrain & Carrier Pipe Construction Details	06-01-94
D-3	Treated Gutters	06-01-94
D-4	Flushing Basins, End Section, Elbows Typical For Culverts Up To and Including 48" Dia., Extension Service Box and Curb Stop, Corrugated Pipe Elbow, Granular Borrow at Culvert Locations, Underdrain Flushing Basin, Corrugated Steel Pipe End Section, Corrugated Steel Pipe Arch End Section	06-01-94
D-5	Concrete Block Manhole, Concrete Block Catch Basin w/Cast Iron Gate, Concrete Block Catch Basin w/Iron Cover	06-01-94
D-6	Reinforced Concrete Drop Inlet w/Gate (Ditches)	06-01-94
D-8	Reinforced Concrete Drop Inlet w/Precast Cover & Gate (Bottom Section), See Sheet D-9, 10, 11 for Top Section	06-01-94

*Figure A-30 (continued)*  
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D-9	Reinforced Concrete Drop Inlet Tops, Vertical Curb & Throat Adapter	06-01-94
D-10	Reinforced Concrete Drop Inlet Tops, Bituminous Concrete Curb & Granite Slope Edging	06-01-94
D-11	Grates & Covers (Type A)	06-01-94
D-13	Reinforced Concrete Manhole & Catch Basin w/Cast Basin Iron Grate	06-01-94
D-15	Precast Reinf. Conc. MG-Grates (Bicycle Safe), Cast Iron Grate w/Frame, Type D, Cast Iron Grate w/Frame, Type E	06-01-94
D-16	Precast Curb CI, Grate, RCP End Section, etc., Cast Iron Grate, Type B, Cast Iron Grate, Type C Underdrain Riser, Reinforced Concrete Pipe End Section, Energy Dissipator for Culvert	06-01-94
D-17	CGM Drop Inlet, Reducer, Riser	06-01-94
D-20	Highway Crossing for Underground Utilities	03-10-95
D-22	Sanitary Sewer Systems	03-10-95
E-10	Approach Signs, Minor Maintenance	08-08-95
E-100	Construction Approach Signs	01-06-97
E-100A	Side Road Construction Approach Signing	01-06-97
E-101	Construction Sign Details	03-10-97
E-102	Construction Sign Details	08-08-95
E-102A	Construction Sign Details	08-08-95
E-103	Mainline Traffic Control Divided Highway, One Lane Closed	08-08-95
E-104	Mainline Traffic Control Divided Highway, One Roadway Closed	12-31-96
E-104A	Pavement Marking Details - Divided Highway - One Roadway Closed	12-27-96
E-105	Traffic Control for Construction Vehicles	08-08-95
E-106	Traffic Control - Miscellaneous Details	08-08-95
E-107	Delineation, Barricades and Detours for Construction Areas	08-08-95
E-107A	Breakaway Barricade Details	08-08-95
E-108	Construction Zone Longitudinal Details	08-18-95
E-109	Traffic Control Devices for Temporary Termination of Freeway Facilities	08-08-95
E-110	Major Maintenance Operation Lane Closure	08-08-95
E-112	Traffic Control for Typical Moving Maintenance Operations	01-23-97
E-119	Utility Work Zone	08-08-95
E-120	Standard Sign Placement - Expressway & Freeway	08-08-95
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E-123	Guide Sign Placement - Miscellaneous Details	08-08-95
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E-125	Travel Information Signs	08-08-95
E-126	Typical Freeway Interchange Signing	04-21-97
E-127	Route Markings at Rural Intersection	08-08-95
E-128A	Detailing Village Signs, A-M	08-08-95
E-128B	Detailing Village Signs, N-W	08-08-95
E-129	Runaway Truck Ramp	08-08-95
E-130	Type "B" Guide Sign, Attachment Details	08-08-95
E-131	Guide Sign Details	08-08-95
E-132	General Motorist Service - Sign Detail	08-18-95
E-133	Service Sign Details	08-08-95
E-134	Bridge Number Plaque	08-08-95
E-135	Interstate Route Marker - Sign Detail	08-13-95
E-136A	U.S. Route Marker - Sign Details	08-08-95

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E-136D	National Forest Route Marker - Sign Details	08-08-95
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E-140	Regulatory Sign Details	08-30-96
E-141	Regulatory Sign Details	09-20-95
E-142	Regulatory Sign Details	09-20-95
E-143	Regulatory Sign Details	09-20-95
E-144	Regulatory Sign Details	09-20-95
E-145A	Regulatory Sign Details - Lane Use Control Signs - Two and Four Lane Approaches	12-23-94
E-145B	Regulatory Sign Details - Lane Use Control Signs Three Lane Approaches	12-23-94
E-146	Regulatory Sign Details	09-20-95
E-150	Warning Sign Details	01-15-97
E-151	Warning Sign Details	08-08-95
E-152	Warning Sign Details	08-08-95
E-153	Warning Sign Details	01-15-97
E-154	Warning Sign Details	08-08-95
E-155	Warning Sign Details	08-08-95
E-160	Flanged Channel Steel Sign Post Detail	08-18-95
E-161	W-Shaped Steel Sign Post	08-18-95
E-162	Tubular Aluminum Sign Post	08-18-95
E-163	Tubular Steel Sign Post	08-18-95
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E-170	Traffic Control Signals Pedestal Post Mounted	08-09-95
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E-171B	Traffic Control Signals Misc. Details	08-09-95
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E-172	Vehicle Detector Loop Details	08-09-95
E-173	Pull Boxes and Junction Boxes	08-09-95
E-175	Power Drop Stanchions	11-17-93
E-180A	Street Lighting Details	08-09-95
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E-190	Railroad Crossing Signs and Pavement Markings	08-18-95
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E-197	Delineator Placement Typical	08-18-95
E-198	Delineators and Mileposts	04-14-97
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F-1	Woven Wire Fence w/Wood Posts, w/Steel Posts, Wood Brace for Woven Wire Fence, Steel Brace for Woven Wire Fence, Drive Gate for Woven Wire Fence, Walk Gate for Woven Wire Fence	06-01-94
F-2	Chain Link Fence, Type I, Drive Gates for Chain Link Fence, Type I, Walk Gate for Chain Link Fence, Type I	06-01-94
F-3	Chain Link Fence, Type III, Drive Gate for Chain Link Fence, Type III, Walk Gate for Chain Link Fence, Type III	06-01-94
F-4	Chain Link Fence, Type II, Drive Gate for Chain Link Fence, Type II, Walk Gate for Chain Link Fence, Type II	06-01-94
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F-6	Chain Link Screening Fence Type I & II, Drive Gate for Chain Link Screening Fence Type I, Walk Gate for Chain Link Screening Fence Type I, Drive Gate for Chain Link	06-01-94
F-7	Drive for Wood Screening Fence	06-01-94
F-8	Pre-Painted Screening Fence, Drive gate for Pre-Painted Screening Fence	06-01-94
G-1	Steel Beam Guardrail (50 mph & over), Heavy Duty Steel Beam Guardrail, Twisted End Terminal, Anchor for Steel Beam Rail	06-01-94
G-1B	Box Beam Guard Rail	06-01-94
G-1D	Steel Beam Guardrail (40 mph & less), Heavy Duty Steel Beam Guardrail, Steel Beam Median Barrier, Anchor for Steel Beam Rail	06-01-94
G-4	Markers - Guide Posts - Plank Guard Rail, Plank Rail, Guide Posts, Wood Marker Posts, Steel Marker Posts	06-01-94
G-5	Cedar Log Guard Rail	06-01-94
G-6	Cable Guard Rail w/Steel Posts - Anchors	06-01-94
G-6A	Cable Guard Rail w/Wood Posts - Anchors	06-01-94
G-10	Anchor for Cable Guard Rail at Openings	02-23-95
G-12	Transition Details, Steel Beam Guardrail to Box Beam Guardrail, Anchor for Steel to Box Beam Transition, Cable Guardrail to Box Beam Guardrail	06-01-94
G-14	Breakaway Cable Terminal w/Wood Posts	06-01-94
G-15	Breakaway Cable Terminal w/Steel Posts	06-01-94
G-16	Steel Beam Guardrail Attachments to Existing Bridge, Terminal Connector For Steel Beam Guardrail	06-01-94
G-17A	Modified Eccentric Loader Terminal w/Wood Posts (MELT)	01-18-96
G-17B	Modified Eccentric Loader Terminal w/Wood Posts (MELT)	06-30-95
G-18	Precast Contract Temporary Traffic Barrier	06-01-94
H-1A	Metal Bin Type Retaining Wall	06-01-94
H-1B	Metal Bin Type Retaining Wall	06-01-94
J-1	Project and Boundary Markers	06-01-94
J-2	Concrete Steps-Hand Railing	06-01-94
J-3	Mailbox Support Detail	08-07-95
J-5	Tree Wells, Bracing, Picnic Tables, etc., Dry Rubble Masonry Tree Wells, Bracing of Trees, Picnic Tables, Wire Rodent Guard	12-19-72
L-1	Settlement Platform, Type I Standpipe Type, Type II Remote Reading Type	03-09-95
L-2	Geotechnical Instrumentation	07-24-95
L-3	Piezometers Type III (Air Actuated)	03-09-95
RR-1	Rail Crossing Highway Standards, Paved Crossing for Gravel or Paved Highways	06-01-94
T-1	Temporary Erosion Control Details	06-01-94
T-2	Temporary Erosion Control Details	06-01-94
SB-R4A-82	Bridge Railing, Galvanized Box Beam	09-19-89
SB-R4B-82	Guard Rail Approach Section, Type I & II	03-30-88
SB-R6-82	Bridge Railing, Heavy Duty Steel Beam, Type A, B, C, D, Bridge Railing Heavy Duty Steel Beam w/Box Beam Hand Rail, Type E	01-06-95
SB-R7-90	Bridge Railing Heavy Duty Steel Beam/Fascia Mounted/Steel Tubing	01-11-95
AP-1	Runway and Taxiway Typicals	06-01-94
AP-2	Lighting and Electrical Details	06-01-94

*Figure A-30 (continued)*  
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AP-3	Miscellaneous Airport Details	06-01-94
AP-4	Visual Approach Aids	06-01-94
AP-5	Tower and Beacon Details	06-01-94
AP-6	Airport Hazard Beacon on Wooden Tower	06-01-94
AP-7	Tower and Obstruction Lights	06-01-94
AP-8	Overhead Power Lines and Guys	06-01-94
AP-9	Transformer Vault Details	06-01-94
AP-10	Runway Marking Details	06-01-94
AP-11	Taxiway and Apron Marking Details	06-01-94
AP-12	Sign Systems	06-01-94
AP-13	Airport Signs	06-01-94
AP-14	Dimensional Standards	06-01-94

Figure A-31

**Transmittal Letter for Submission of Plans**



**webster-martin, inc.**

Consulting Engineers

A DVI Company

P.O. Box 2246  
1025 Airport Drive  
South Burlington, Vermont 05407

Tel: 802-864-0223  
Fax: 802-864-0165  
E-Mail: wmi@together.net

June 12, 1997

E. Mark Woolaver, Design Engineer  
Pavement Management  
VT Agency of Transportation  
133 State Street  
Montpelier, VT 05633

RE: **STP 9663(1)S; VT Route 139**  
**Richford, Vermont**  
**W-M Project No. 04-9517**

Dear Mr. Woolaver:

I am pleased to submit one (1) full size and two (2) half size copies of Contract Design Plans dated June 12, 1997, and a final cost estimate for the above-referenced STP project.

Also included is the design/quantity computation book, a set of two (2) disks containing the entire project in one (1) electronic design file named pc212.dgn and a mylar of the title sheet, signed and stamped as requested.

As you requested, I have not sent these plans to the various reviewers within the Agency, the Village of Richford, the U.S. Immigration Service, the U.S. Government General Services Administration or The Bangor & Aroostook Railroad System.

This completes our requirements for this project. Please do not hesitate to call with any questions or comments.

Very truly yours,

John L. Little  
Senior Design Technician

Enclosures

hwy\0030915

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South Burlington, Vermont • Bedford, New Hampshire • Westford, Massachusetts

Figure A-32

**Transmittal Letter for Receipt of Plans**



VERMONT AGENCY OF TRANSPORTATION  
 PAVEMENT MANAGEMENT DIVISION  
 133 STATE STREET  
 MONTPELIER, VERMONT 05633  
 TELEPHONE (802) 828-2793



Letter of Transmittal		
<b>To:</b>	<b>From:</b>  VT Agency of Transportation 133 State Street Montpelier, VT 05633  FAX: (802) 828-2848	<b>Date:</b>  <b>Attention:</b>  <b>Job Number:</b>  <b>Re:</b>
<b>We are sending you:</b> <input type="checkbox"/> attached <input type="checkbox"/> under separate cover by _____ <input type="checkbox"/> Drawings <input type="checkbox"/> Prints <input type="checkbox"/> Samples <input type="checkbox"/> Plans <input type="checkbox"/> Copy of Letter <input type="checkbox"/> Change Order <input type="checkbox"/> Specifications <input type="checkbox"/> Other _____		
Copies	Date or Number	Description
<input type="checkbox"/> For approval <input type="checkbox"/> Approved as submitted <input type="checkbox"/> Resubmit _ copies for approval <input type="checkbox"/> For your use <input type="checkbox"/> Approved as noted <input type="checkbox"/> Submit _ copies for distribution <input type="checkbox"/> As requested <input type="checkbox"/> Returned for corrections <input type="checkbox"/> Return _ corrected prints <input type="checkbox"/> For review and comment <input type="checkbox"/> Other _____ <input type="checkbox"/> Prints returned after loan to us		
<b>Remarks:</b>		
Signed: _____		

Copy to: Design File

Figure A-33

**Unit Price List**  
**Example Sheet from Price List**

JUNE 17, 1996 - VT AGENCY OF TRANSPORTATION - P.E. UNIT PRICES

ITEM	DESCRIPTION	UNIT	LOW	AVERAGE	HIGH
303.25	PLANT MIXED BASE COURSE	T		\$40.00	
310.20	RECLAIMED STABILIZED BASE	m <sup>2</sup>	\$1.20	\$1.50	\$3.00
310.22	LIQUID CALCIUM CHLORIDE	kg		\$0.15	
401.10	AGGREGATE SURFACE COURSE	m <sup>3</sup>	\$13.00	\$16.00	\$26.00
402.10	AGGREGATE SHOULDERS, IN PLACE	m <sup>3</sup>	\$13.00	\$20.00	\$26.00
402.11	AGGREGATE SHOULDERS, TRUCK MEASURE	m <sup>3</sup>	\$20.00	\$26.00	\$33.00
402.12	AGGREGATE SHOULDERS	T	\$6.00	\$13.00	\$33.00
404.45	TAR EMULSION	L		\$4.00	
404.46	TAR EMULSION	kg			
404.65	EMULSIFIED ASPHALT	kg	\$0.20	\$0.45	\$1.10
406.25	BITUMINOUS CONCRETE PAVEMENT	T		SEE GRAPH	
406.50	PRICE ADJUSTMENT ASPHALT CEMENT	LS		\$1.00	
409.25	OPEN GRADED ASPHALT FRICTION CRSE	T		\$33.00	
417.10	BITUMINOUS CRACK FILLING	kg		\$7.00	
501.21	CONCRETE, CLASS AA	m <sup>3</sup>	\$360.00	\$525.00	\$655.00
501.22	CONCRETE, CLASS A	m <sup>3</sup>		SEE GRAPH	
501.25	CONCRETE, CLASS B	m <sup>3</sup>		SEE GRAPH	
501.30	CONCRETE, CLASS C	m <sup>3</sup>	\$229.00	\$262.00	\$327.00
501.31	CONCRETE, CLASS D	m <sup>3</sup>		\$196.00	
501.40	CONCRETE, CLASS LW	m <sup>3</sup>		\$379.00	
501.55	MORTAR, TYPE I	m <sup>3</sup>		\$523.00	
501.58	MORTAR, TYPE IV	m <sup>3</sup>		\$589.00	
501.60	SILICA-FUME CONCRETE	m <sup>3</sup>	\$392.00	\$523.00	\$654.00
502.10	SHORING SUPERSTRUCTURE	LS	\$10,000.00	\$15,000.00	\$20,000.00
502.11	SHORING SUPERSTRUCTURE BEARINGS	EA	\$300.00	\$500.00	\$4,700.00
503.10	PREPARING SUBSURFACE FOR DRIVING PILING	LS			
504.10	FURNISHING EQUIPMENT FOR DRIVING PILING	LS	\$5,000.00	\$10,000.00	\$15,000.00
505.15	STEEL PILING (HP 310 X 79)	m	\$82.00	\$95.00	\$115.00
505.16	STEEL PILING (HP 310 X 110)	m		\$98.00	
505.17	STEEL PILING (HP 360 X 108)	m	\$82.00	\$98.00	\$115.00
505.18	STEEL PILING (HP 360 X 132)	m		\$118.00	



Figure A-33 (continued)

Unit Price List  
Example Graph

PAY ITEM 406.25: BITUMINOUS CONCRETE PAVEMENT

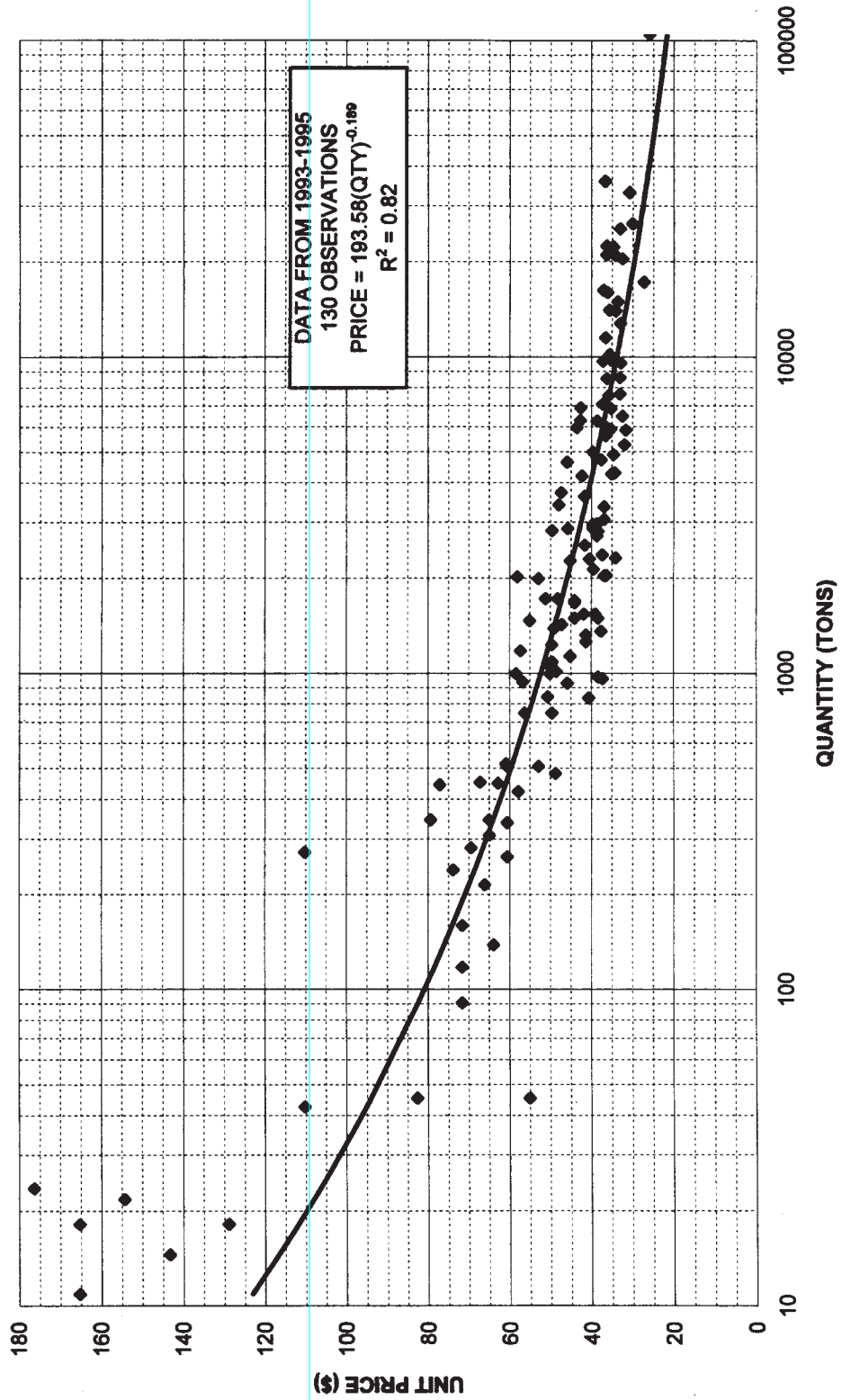


Figure A-34

**Project Cost Estimate**

**McFARLAND – JOHNSON ENGINEERS, INC.**  
FINAL ENGINEERS ESTIMATE

PROJECT NAME: BRISTOL  
PROJECT NUMBER: STP 9653  
ROUTE: VERMONT ROUTE 116

PREPARED BY: RAL  
DATE: 2/6/97

ITEM #	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
203.15	COMMON EXCAVATION	m <sup>3</sup>	20	16.50	330.00
203.16	SOLID ROCK EXCAVATION	m <sup>3</sup>	10	65.00	650.00
203.30	EARTH BORROW	m <sup>3</sup>	140	9.00	1260.00
204.20	TRENCH EXCAVATION OF EARTH (N.A.B.I.)	m <sup>3</sup>	1	0.00	0.00
210.10	COLD PLANING – BIT. PAVEMENT	m <sup>2</sup>	11430	2.00	22860.00
212.20(MOD)	SCARIFYING PAVEMENT (MODIFIED)	m <sup>2</sup>	50	0.80	40.00
301.28	SUBBASE OF CRUSHED GRAVEL – (FINE GRADED)	t	160	28.00	4480.00
402.12	AGGREGATE SHOULDERS	t	110	33.00	3630.00
404.65	EMULSIFIED ASPHALT	kg	2870	1.10	3157.00
406.25	BITUMINOUS CONCRETE PAVEMENT (PG 64 – 28)	t	2950	38.00	112100.00
406.50	PRICE ADJUSTMENT ASPHALT CEMENT (N.A.B.I.)	LS	1	0.00	0.00
604.40	CHANGING ELEVATION OF DI, CB, OR MH	EA	1	550.00	550.00
604.412	REHABILITATION OF DI, CB, OR MH, CLASS I	EA	4	800.00	3200.00
604.415	REHABILITATION OF DI, CB, OR MH, CLASS II	EA	5	800.00	4000.00
604.418	REHABILITATION OF DI, CB, OR MH, CLASS III	EA	4	800.00	3200.00
604.42	CHANGING ELEVATION OF SEWER MANHOLE	EA	1	400.00	400.00
608.25	ALL PURPOSE EXCAVATOR RENTAL, TYPE 1	HR	100	75.00	7500.00
608.30	POWER BROOM RENTAL	HR	100	25.00	2500.00
608.37	TRUCK RENTAL	HR	100	35.00	3500.00
608.40	LOADER RENTAL, TYPE 1	HR	100	35.00	3500.00
613.10	STONE FILL, TYPE I	m <sup>3</sup>	20	39.00	780.00
616.21	VERTICAL GRANITE CURB	m	10	82.00	820.00
616.35	TREATED TIMBER CURB	m	50	16.00	800.00
616.40	REMOVING AND RESETTNG CURB (GRANITE)	m	15	66.00	990.00
616.47	BITUMINOUS CONCRETE GUTTERS AND TRAFFIC ISLANDS	t	63	35.00	2205.00
618.10	PORTLAND CEMENT CONCRETE SIDEWALK, 125 mm	m <sup>2</sup>	65	41.90	2723.50
621.20	STEEL BEAM GUARD RAIL	m	380	10.00	3800.00
621.20(MOD)	STEEL BEAM GUARD RAIL (MODIFIED) (W/2.4m STEEL POSTS)	m	105	10.00	1050.00
621.54	MODIFIED ECCENTRIC LOADER TERMINAL	EA	6	1300.00	7800.00
621.60	ANCHOR FOR STEEL BEAM RAIL	EA	2	450.00	900.00
621.80	REMOVAL AND DISPOSAL OF GUARD RAIL	m	520	6.00	3120.00
629.20	ADJUST ELEVATION OF VALVE BOX	EA	19	150.00	2850.00
				SUBTOTAL	\$204,695.50

FILE B:RT116.WK1

Figure A-34 (continued)

**Project Cost Estimate**

**McFARLAND – JOHNSON ENGINEERS, INC.**  
FINAL ENGINEERS ESTIMATE

PROJECT NAME: BRISTOL  
PROJECT NUMBER: STP 9653  
ROUTE: VERMONT ROUTE 116

PREPARED BY: RAL  
DATE: 2/6/97

ITEM #	DESCRIPTION	UNIT	QUANTITY	PRICE	AMOUNT
630.10	UNIFORMED TRAFFIC OFFICER (N.A.B.I.)	HR	400	0.00	0.00
630.15	FLAGGERS (N.A.B.I.)	HR	800	0.00	0.00
631.16	TESTING EQUIPMENT – CONCRETE	LS	1	1000.00	1000.00
631.17	TESTING EQUIPMENT – BITUMINOUS	LS	1	500.00	500.00
635.10	MOBILIZATION (7%)	LS	1	0.00	0.00
646.40	DURABLE 100mm WHITE LINE	m	4250	1.00	4250.00
646.41	DURABLE 100mm YELLOW LINE	m	3800	1.00	3800.00
646.46	DURABLE 600mm STOP BAR	m	60	13.00	780.00
646.50	DURABLE LETTER OR SYMBOL	EA	41	52.00	2132.00
646.51	DURABLE CROSSWALK W/DIAGONAL LINES	m	190	23.00	4370.00
646.60	TEMPORARY 100mm WHITE LINE	m	8500	0.16	1360.00
646.61	TEMPORARY 100mm YELLOW LINE	m	7600	0.16	1216.00
646.66	TEMPORARY 600mm STOP BAR	m	110	2.15	236.50
646.70	TEMPORARY LETTER OR SYMBOL	EA	82	3.50	287.00
646.71	TEMPORARY CROSSWALK W/DIAGONAL LINES	m	370	6.00	2220.00
646.76	LINE STRIPING TARGETS	EA	170	0.85	144.50
649.31	GEOTEXTILE UNDER STONE FILL	m <sup>2</sup>	100	3.30	330.00
651.15	SEED	kg	5	26.50	132.50
651.18	FERTILIZER	kg	35	4.40	154.00
651.20	AGRICULTURAL LIMESTONE	t	1	441.00	441.00
651.25	HAY MULCH	t	1	551.00	551.00
651.35	TOP SOIL	m <sup>3</sup>	35	59.00	2065.00
675.20	TRAFFIC SIGNS, TYPE A	m <sup>2</sup>	9	151.00	1359.00
	** BEGIN OPTION ITEMS **				
675.30	FLANGED CHANNEL SIGN POST	kg	330	5.50	1815.00
675.34	SQUARE TUBE STEEL POSTS AND ANCHORS	kg	330	0.00	0.00
	** END OPTION ITEMS **				
675.50	REMOVING SIGNS	EA	8	10.00	80.00
				SUBTOTAL	\$29,223.50
				SUBTOTAL	\$204,695.50
				MOBILIZATION (7%)	\$16,374.33
				TOTAL	\$250,293.33
				ROUNDED	\$250,500.00

FILE B:RT116.WK1

Figure A-35

**Right-of-Way Certificate  
State Highway**

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

CONSTRUCTION & MAINTENANCE DIVISION

**TO:** Stephen P. O'Connor, Chief of Contract Administration

**FROM:** Gordon B. MacArthur, Director of Construction and Maintenance

**DATE:** June 9, 1997 *Wm. Mitchell Hayes FOR GEM*

**SUBJECT:** Project R.O.W. Certification

**RE:** South Burlington NH 9627(1)s

I hereby certify that the above referenced project, as designed, will be constructed entirely within the State's existing right-of-way.

c: Design File  
Central files  
PM File

row.men

Figure A-36

**Right-of-Way Certificate  
Class 1 Town Highway**

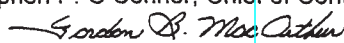
AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

---

PAVEMENT MANAGEMENT SECTION

---

**TO:** Stephen P. O'Connor, Chief of Contract Administration  
**FROM:**   
Gordon B. MacArthur, Director of Construction and Maintenance  
**DATE:** June 19, 1997  
**SUBJECT:** Project R.O.W. Certification  
Class 1 Town Highway  
**RE:** Richford STP 9663(1)s

Based on information as supplied by the municipality, I hereby certify that the above referenced project, as designed, will be constructed entirely within the city's existing right-of-way.

c: Design File  
Central files  
PM File

cl1row.msm

Figure A-37

**Disposition of Salvageable Material**

VERMONT  
AGENCY OF TRANSPORTATION  
OCTOBER 1992  
DISPOSITION OF SALVAGEABLE MATERIAL

The Agency has adopted the following protocol for use of salvageable material obtained from contracted projects, addressing current federal guidelines.

The following procedure shall be followed for salvageable material:

- a. The responsibility for insuring that the contract provides for the effective use of salvageable material exists with the applicable design unit (Design Division, PMS, or consultant administrator). The responsibility for determining the use of any salvageable material should be a joint decision between the responsible design unit and the Maintenance Engineer.
- b. If any salvageable material is to be reused on the specified project or another ongoing project, the designer is responsible for the necessary coordination and providing the required information to Contract Administration.
- c. If any salvageable material is stockpiled for future use at a District maintenance facility, Contract Administration requires that the designer provide them a copy of the memo signed by the DTA verifying that the material is needed and indicates the designated storage facility.
- d. Current federal guidelines for participation in salvaged material are:
  - (1) All material is to be delivered to the same location.
  - (2) Delivery shall be made to the nearest appropriate maintenance facility.
  - (3) Haul distances shall not be greater than ten miles from the project.
  - (4) If these guidelines cannot be met, the contract shall include the required non-participating items necessary to address the salvageable material.
  - (5) Federal funding will not be used to participate in the cost of stockpiling. For example, the costs of a crane to move salvaged steel beams within a storage area after delivery from a project or the costs for a loader to maintain stockpiles of salvaged reclaimed asphalt pavement are not eligible for federal funding.

Figure A-37 (continued)

**Disposition of Salvageable Material**

- e. Salvaged material from federally funded projects must be reused for federal funded projects or become the property of the contractor, as specified in the contract. If the estimated value for an item of salvaged material to be stockpiled for reuse on another federally funded project exceeds \$5,000.00, the designer must provide Contract Administration with a copy of the certification from the responsible individual, usually the Maintenance Engineer, indicating that the salvaged material will only be used on federal-aid highways.
  - f. If no information is provided to Contract Administration, it shall be understood that any material not otherwise specified in the contract will belong to the Contractor in accordance with the 1990 Standard Specifications for Construction.
2. Disposition of any material salvageable from a project must be decided prior to contract development and be clearly spelled out in the contract.
  3. Prioritization of the use of salvageable material will depend on its quality, composition, consistency and potential for reuse or recycling.
  4. Preferred options for use of salvageable materials are:
    - a. First: Reuse on the project.
    - b. Second: Delivery to a designated district storage facility.
    - c. Third: Re-use on another designated project.
    - d. Fourth: Become the property of the contractor.
  5. Once a decision has been made during the design phase of the project and the disposition of the salvageable material has been incorporated in the contract documents, no post award deviation from the contract provisions governing disposition of the salvageable material will be permitted.

Figure A-38

**Memorandum for the Disposal of Salvageable Material**

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

---

CONSTRUCTION AND MAINTENANCE DIVISION

---

TO: District Transportation Administrator \_\_\_\_\_

FROM: \_\_\_\_\_, Pavement Management Design Engineer

DATE:

SUBJECT: Salvaging Materials

re:

Upon your review, if the above project provides for removal of the following items, please advise as to the desirability of retaining the materials for district use.

		Yes	No
210.10	Cold Planing-Bituminous Pavement	[ ]	[ ]
621.80	Removal and Disposal of Guard Rail	[ ]	[ ]

Signature: \_\_\_\_\_  
DTA #

In the event that you would like to retain any of the above mentioned materials, we request that you provide a proposed location within reasonable vicinity of the project for delivery by the Contractor. Your signature and reply by \_\_\_\_\_ is appreciated.

c Central Files  
Specifications Engineer \_\_\_\_\_ via Contract Admin. Chief \_\_\_\_\_  
Design File via \_\_\_\_\_

20 Oct 92



Figure A-39

### Field Office Requirements Form

AGENCY OF TRANSPORTATION	OFFICE MEMORANDUM		
<b>CONSTRUCTION &amp; MAINTENANCE DIVISION</b>			
<b>TO:</b>	_____, Project Design Engineer		
<b>FROM:</b>	_____, Regional Construction Engineer		
<b>DATE:</b>	_____		
<b>SUBJECT:</b>	Field Office Requirements Project: _____		
Equipment in Engineer's Field Office:			
<input type="checkbox"/> Computer	<input type="checkbox"/> Fax	<input type="checkbox"/> Copier	<input type="checkbox"/> Bottled Water
<input type="checkbox"/> Telephone	<input type="checkbox"/> Other		
Size of Office:			
<input type="checkbox"/> L 240 SF	<input type="checkbox"/> 360 SF	<input type="checkbox"/> 360 SF 10' wide	<input type="checkbox"/> 460 SF
Testing Equipment:			
<input type="checkbox"/> Bituminous Testing	<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Other _____	
Work Site Traffic Control: <input type="checkbox"/> YES <input type="checkbox"/> NO			
Other:		Estimated Cost: \$ _____	
c: Contract Administration Central Files PM Files			
fieldo.wpd			

Figure A-40

**Construction Duration Form**

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

---

**PAVEMENT MANAGEMENT SECTION**

---

**TO:** Regional Construction Engineer \_\_\_\_\_**FROM:** E.Mark D. Woolaver, Pavement Design Engineer**DATE:** 7 November 1997**SUBJECT:** Contract Duration Specification  
\_\_\_\_\_

The subject project is candidate for a contract duration specification. We anticipate our submission to Contract Administration to be on or about \_\_\_\_\_ with a bid opening date to be set shortly thereafter. This project is/is not grouped with others to create a contract package. The current engineers estimate is attached for your use.

A "required construction duration" form is attached for your review and completion of the "general" section on page one of the form. Any revisions from our normal production rates are shown in the revised column in the form. Should you feel a need to revise other rates, an explanation must be provided in the remarks area on page one of the form.

Your earliest return of the attached form is requested such that we may have the information incorporated into the project special provisions and remain on schedule for the 98 season. Should additional information be required on project specifics, call any of those identified on the form.

EMW:Attachments

cc: Design File w/attach  
Woolaver file w/attach  
PM File w/attach

Figure A-40 (continued)

**Construction Duration Form**

**VERMONT AGENCY OF TRANSPORTATION**

**CONSTRUCTION AND MAINTENANCE DIVISION**

**PAVEMENT MANAGEMENT SECTION**

**REQUIRED CONSTRUCTION DURATION**

Project Data:

Project Name: \_\_\_\_\_ Route No./Location: \_\_\_\_\_  
Project Number: \_\_\_\_\_ Description: \_\_\_\_\_  
Project Cost Estimate: \_\_\_\_\_ Contract Plan Date: \_\_\_\_\_

Program Data:

Program Manager: \_\_\_\_\_ Design Consultant: \_\_\_\_\_  
Project Manager: \_\_\_\_\_ Reg. Constr. Engr.: \_\_\_\_\_  
Design Manager: \_\_\_\_\_ Resident Engineer: \_\_\_\_\_

General:

Defer to Set Contract Completion Date? \_\_\_\_\_ Date: \_\_\_\_\_  
Single Season Completion Possible? \_\_\_\_\_ Year(s)? \_\_\_\_\_

Remarks:

1. A 7 day mobilization period has been allowed beginning from the point of erecting Construction Approach signing
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_

Figure A-40 (continued)

**Construction Duration Form**

Construction Duration Calculation Form - Class I Town Highways

Duration Item	Contract Quantity	Unit	Amount Per & Hour Work Day		Remark*	Possible Work Days		Reduction*	Probable Work Days	
			Normal	Revised		Individual	Cumulative		Individual	Cumulative
Mobilization	1	LS	7		1	7	7	-	7	7
Cold Planning		SM	2100							
Prep. Work	PROJECT	DAYS	5							
Level Course		TON	225							
DI / MH / ADA		EA	2							
Wear Course		TON	550							
Drives/SRoads		TON	45							
Signs / Lines	PROJECT	DAYS								
<b>SUBTOTAL</b>	PROJECT	DAYS								
Weekends		DAYS								
Holidays		DAYS								
Other Below (List)		DAYS								
<b>DURATION</b>		DAYS								

\*Supply Justification for all Remarks and / or Reduction Factors on Previous Sheet

Figure A-40 (continued)

**Construction Duration Form**

Construction Duration Calculation Form - State Highways

Duration Item	Contract Quantity	Unit	Amount Per 8 Hour Work Day		Remark*	Possible Work Days		Reduction*	Probable Work Days	
			Normal	Revised		Individual	Cumulative		Individual	Cumulative
Mobilization	1	LS	7		1	7	7	-	7	7
Excav. Rent		DAYS								
Prep. Work	PROJECT	DAYS								
Cold Planning		SM	850							
Level Course		TON	650							
DI / MH / ADA		EA	2							
Wear Course		TON	1100							
Agg Shldfs		TON	375							
SRoads		TON	65							
Signs / Lines	PROJECT	DAYS								
Guardrail Runs		M	250							
Guardrail Ends		EA	3							
<b>SUBTOTAL</b>		DAYS								
Weekends		DAYS								
Holidays		DAYS								
Other Below (List)		DAYS								
<b>DURATION</b>		DAYS								

\*Supply Justification for all Remarks and / or Reduction Factors on Previous Sheet

Figure A-41

**Consultant Evaluation Form**

Revised 11/96

**STATE OF VERMONT - AGENCY OF TRANSPORTATION  
CONSULTANT PERFORMANCE EVALUATION**

Name of Firm: \_\_\_\_\_ Interim Evaluation \_\_\_\_ Final Evaluation \_\_\_\_  
 Address: \_\_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Date of Contract \_\_\_\_\_  
 Project Name and Number: \_\_\_\_\_  
 Type of work performed under this Contract: \_\_\_\_\_  
 \_\_\_\_\_  
 Contract Amount: \_\_\_\_\_ Contract Number: \_\_\_\_\_

Rate the Consultant's performance for each of the categories listed below.

**A. STAFFING**

- 1. Sufficient Personnell ....
- 2. Competence .....
- 3. Cooperativeness .....

Very Good	Good	Needs Some Improvement	Unsatisfactory

**B. PROCESS**

- 1. Communication .....
- 2. Timeliness/Responsiveness .
- 3. Public Relations .....


**C. PRODUCT**

- 1. Quality .....
- 2. Scope/Cost Containment.....


Summary & Recommendations: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Signature of Rater: \_\_\_\_\_ Date: \_\_\_\_\_

Signature of Special Projects Engineer: \_\_\_\_\_ Date: \_\_\_\_\_

Signature of Consultant's Project Manager: \_\_\_\_\_ Date: \_\_\_\_\_

(Signature only indicates receipt of the evaluation)

cc: Consultant Firm  
 Contract Administration  
 Pavement Management File  
 Secretary of AOT

Figure A-41 (continued)

**Consultant Evaluation Form**

EXPLANATION OF CONSULTANT EVALUATION CRITERIA

A. STAFFING:

1. Adequate in Size. (Were sufficient personnel available and assigned to the project?)
2. Competence. (Did assigned staff have the qualifications, experience and training sufficient to satisfactorily accomplish the work?)
3. Cooperative. (Was the consultant cooperative with Agency staff in accomplishing all tasks associated with the project?)
4. Creativity/Innovation. (Did the consultant demonstrate good problem solving skills in the management of the project, and the ability to think creatively in identifying alternative solutions to design problems? Did the consultant attempt to anticipate and solve problems before they occurred?)

B. PROCESS:

1. Communication. (Did the consultant maintain frequent and on-going communication with the Agency's project manager, using telephone, FAX and other time-saving methods as appropriate to relay project information, solve problems and avoid unnecessary delays? Were monthly progress reports timely and informative?)
2. Timeliness/Responsiveness. (Were project submittals on time? Were special requests and studies done in a timely manner, and did they reflect what was asked for? Were project activities pursued in a diligent manner, and were missed due dates due to circumstances within or outside of the consultant's control?)
3. Work Organization. (Was project development pursued in a logical manner? Were activities done in the proper sequence, to minimize delay?)
4. Hearings & Meetings. (Were hearing displays satisfactorily prepared? Did the consultant adequately present and explain the project at hearings and meetings? Did the consultant adequately document, in writing, hearings and meetings as requested?)
5. Invoices & Amendments. (Were invoices submitted free of errors and unallowed charges in the proper format? Were requests for amendments handled expeditiously, and did the information submitted contain sufficient justification and cost information to allow for a prompt decision?)
6. Public Relations. (Did the consultant's representative conduct themselves in a professional and polite manner when dealing with property owners, Town and City officials, other agency personnel and the general public? Were the Agency and its projects presented in a positive manner?)

C. PRODUCT:

1. Quality. (Were plans, reports, estimates and other documents neat, free of errors, complete and unambiguous? Were design decisions adequately documented and justified? Was the design constructable?)
2. Scope/Cost Containment. (Did the consultant strive to keep the project scope and cost within original limits and estimates? Were alternatives adequately explored, and increases adequately justified?)

Figure A-42  
**HighEst Estimate**

State of Vermont  
 Agency of Transportation  
 HighEst Detailed Estimate Assembly Item Lists

Page 1  
 Jul 8, 1997  
 8:57 AM

Contract Number: 96c126

Project: BARTON, STP 9713(1)S

-----  
 Assembly Item List "ROADWAY" total is \$928,746.81 /LS

203.28	2,500.0000 CM @	\$14.00 =	\$35,000.00
0005	EXCAVATION OF SURFACES AND PAVEMENTS		
203.30	560.0000 CM @	\$10.00 =	\$5,600.00
0010	EARTH BORROW		
204.20	1.0000 CM @	\$14.00 =	\$14.00
0015	TRENCH EXCAVATION OF EARTH (N. A. B. I.)		
210.10	610.0000 SM @	\$8.30 =	\$5,063.00
0020	COLD PLANING-BIT.PAVEMENT		
301.28	1.0000 T @	\$17.00 =	\$17.00
0025	SUBBASE OF CRUSHED GRAVEL (FINE GRADED)		
402.12	275.0000 T @	\$13.00 =	\$3,575.00
0030	AGGREGATE SHOULDERS		
404.65	162,000.0000 KG @	\$0.55 =	\$89,100.00
0035	EMULSIFIED ASPHALT (Modified)		
404.65	7,525.0000 KG @	\$0.45 =	\$3,386.25
0040	EMULSIFIED ASPHALT		
406.30	16,200.0000 TON @	\$36.00 =	\$583,200.00
0045	SUPERPAVE BITUMINOUS CONCRETE PAVEMENT (PG 58-34)		
406.50	0.5000 LU @	\$1.00 =	\$0.50
0050	PRICE ADJUSTMENT ASPHALT CEMENT (NOT A BID ITEM)		
604.412	2.0000 EACH @	\$1,200.00 =	\$2,400.00
0055	REHABING DI CB OR MH CLASS I		
604.415	3.0000 EACH @	\$1,500.00 =	\$4,500.00
0060	REHABING DI CB OR MH CLASS II		
604.418	3.0000 EACH @	\$1,800.00 =	\$5,400.00
0065	REHABING DI CB OR MH CLASS III		
608.15	95.0000 HR @	\$45.00 =	\$4,275.00
0070	POWER GRADER RENTAL		
608.25	95.0000 HR @	\$75.00 =	\$7,125.00
0075	ALL PURPOSE EXCAVATOR RENTAL, TYPE I		
608.30	65.0000 HR @	\$25.00 =	\$1,625.00
0080	POWER BROOM RENTAL		
608.37	95.0000 HR @	\$35.00 =	\$3,325.00
0085	TRUCK RENTAL		
608.40	95.0000 HR @	\$35.00 =	\$3,325.00
0090	LOADER RENTAL, TYPE I		



Figure A-42 (continued)

**HighEst Estimate**

State of Vermont  
 Agency of Transportation  
 HighEst Detailed Estimate Assembly Item Lists

Page 2  
 Jul 8, 1997  
 8:57 AM

Contract Number: 96c126

Project: BARTON, STP 9713(1)S

619.17	58.0000 EACH @	\$17.00 =	\$986.00
0095	YIELDING MARKER POSTS		
621.20	760.0000 M @	\$33.00 =	\$25,080.00
0100	STEEL BEAM GUARD RAIL		
621.20	16.0000 M @	\$36.00 =	\$576.00
0105	STEEL BEAM GUARD RAIL (MOD) (W/2.4M STEEL POSTS)		
621.21	160.0000 M @	\$48.00 =	\$7,680.00
0110	HEAVY DUTY STEEL BEAM GUARD RAIL		
621.54	24.0000 EACH @	\$1,000.00 =	\$24,000.00
0115	MODIFIED ECCENTRIC LOADER TERMINAL		
621.60	4.0000 EACH @	\$400.00 =	\$1,600.00
0120	ANCHOR FOR STEEL BEAM RAIL		
621.80	930.0000 M @	\$4.00 =	\$3,720.00
0125	REMOVL AND DISP OF GUARD RAIL		
621.81	2.0000 EACH @	\$15.00 =	\$30.00
0130	REMOVL AND DISP OF GUIDE POSTS		
630.10	780.0000 HR @	\$40.00 =	\$31,200.00
0135	UNIFORMED TRAFFIC OFFICERS (N. A. B. I.)		
630.15	625.0000 HR @	\$12.00 =	\$7,500.00
0140	FLAGGERS (N. A. B. I.)		
635.10	0.5000 LS @	\$84,146.42 =	\$42,073.21
0145	MOBILIZATION		
646.40	12,500.0000 M @	\$1.00 =	\$12,500.00
0150	DURABLE 100 MM WHITE LINE		
646.41	7,400.0000 M @	\$1.00 =	\$7,400.00
0155	DURABLE 100 MM YELLOW LINE		
646.60	12,500.0000 M @	\$0.16 =	\$2,000.00
0160	TEMPORARY 100 MM WHITE LINE		
646.61	7,400.0000 M @	\$0.16 =	\$1,184.00
0165	TEMPORARY 100 MM YELLOW LINE		
646.76	525.0000 EACH @	\$0.85 =	\$446.25
0170	LINE STRIPING TARGETS		
651.15	15.0000 KG @	\$17.10 =	\$256.50
0175	SEED		
651.18	115.0000 KG @	\$2.80 =	\$322.00
0180	FERTILIZER		
651.20	1.0000 T @	\$248.00 =	\$248.00
0185	AGRICULTURAL LIMESTONE		

Figure A-42 (continued)

**HighEst Estimate**

State of Vermont  
 Agency of Transportation  
 HighEst Detailed Estimate Assembly Item Lists

Page 3  
 Jul 8, 1997  
 8:57 AM

Contract Number: 96c126                      Project: BARTON, STP 9713(1)S

651.25	1.0000 T	@	\$358.00	=	\$358.00
0190	HAY MULCH				
651.35	20.0000 CM	@	\$39.00	=	\$780.00
0195	TOPSOIL				
675.20	4.9000 SM	@	\$129.00	=	\$632.10
0200	TRAFFIC SIGNS, TYPE A				
675.30	228.0000 KG	@	\$5.00	=	\$1,140.00
0205	FLANGED CHANNEL SIGN POSTS (BEGIN OPTION ITEMS)				
675.34	228.0000 KG	@	\$0.00	=	\$0.00
0210	SQUARE TUBE STEEL POSTS AND ANCHORS (END OPTION ITEMS)				
675.50	16.0000 EACH	@	\$4.00	=	\$64.00
0215	REMOVING SIGNS				
675.60	4.0000 EACH	@	\$10.00	=	\$40.00
0220	ERECTING SALVAGED SIGNS				
Assembly Item List "ROADWAY" Total				=	\$928,746.81

Assembly Item List "BRIDGE" total is \$12,133.00 /LS

501.22	1.0000 CM	@	\$1,000.00	=	\$1,000.00
0005	CONCRETE, CLASS A				
507.15	100.0000 KG	@	\$1.10	=	\$110.00
0010	REINFORCING STEEL				
525.10	70.0000 M	@	\$10.00	=	\$700.00
0015	REMOVAL OF EXISTING RAILING				
525.40	100.0000 M	@	\$98.00	=	\$9,800.00
0020	BRIDGE RAILING - HD STEEL BEAM/CURB MOUNTED MOD II				
529.25	1.0000 CM	@	\$523.00	=	\$523.00
0025	REMOVAL OF CONCRETE OR MASONRY				
Assembly Item List "BRIDGE" Total				=	\$12,133.00

Assembly Item List "FULL E&C" total is \$11,400.00 /LS

631.10	1.0000 LS	@	\$10,000.00	=	\$10,000.00
0005	FIELD OFFICE-ENGINEERS				

Figure A-42 (continued)

**HighEst Estimate**

State of Vermont  
Agency of Transportation  
HighEst Detailed Estimate Assembly Item Lists

Page 4  
Jul 8, 1997  
8:57 AM

Contract Number: 96c126

Project: BARTON, STP 9713(1)S

631.16	0.6000 LS @	\$750.00 =	\$450.00
0010	TESTING EQUIPMENT - CONCRETE		
631.17	0.5000 LS @	\$500.00 =	\$250.00
0015	TESTING EQUIPMENT - BITUMINOUS		
631.25	1.0000 LU @	\$700.00 =	\$700.00
0020	FIELD OFFICE - TELEPHONE (N. A. B. I.)		
-----			
Assembly Item List "FULL E&C" Total =			\$11,400.00
-----			

Figure A-42 (continued)

**HighEst Estimate**

State of Vermont  
 Agency of Transportation  
 HighEst Detailed Estimate

Page 5  
 Jul 8, 1997  
 8:57 AM

Contract Number: 96c126                      Project: BARTON, STP 9713(1)S

Estimated by: PAVEMENT MANAGEMENT    Mar 13, 1997  
 Checked by:  
 Approved by:

Units: Metric                                      Spec Year: 95  
 County: Orleans                                  Work Type: PAVE

Letting Date: Jul 08, 1997

Total Estimate: \$952,279.81

-----					
1011	1.0000	LS	@	\$928,746.81	= \$928,746.81
0005 ROADWAY					
Price based on Assembly Item List "ROADWAY", page 1.					
1022	1.0000	LS	@	\$0.00	= \$0.00
0010 NON-GOV'T					
1031	1.0000	LS	@	\$0.00	= \$0.00
0015 EMPLOYEE TRAINEESHIP					
1211	1.0000	LS	@	\$12,133.00	= \$12,133.00
0020 BRIDGE					
Price based on Assembly Item List "BRIDGE", page 3.					
9999	1.0000	LS	@	\$11,400.00	= \$11,400.00
0025 FULL E&C					
Price based on Assembly Item List "FULL E&C", page 3.					
-----					
				Project Total =	\$952,279.81

Figure A-43

**Policy on Standardizing CADD Files**

<p align="center"><b>VERMONT AGENCY OF TRANSPORTATION</b></p>	<p>ORIGINAL POLICY ADOPTED DATE: 2/26/97</p>	<p>ORIGINAL POLICY IDENTIFIER  N/A</p>
<p align="center"><b>POLICY MANUAL</b></p>	<p>EFFECTIVE DATE 4/4/97</p>	<p>IDENTIFIER 8012</p>
	<p>RESPONSIBLE SECTION EA</p>	<p>SUPERCEDES N/A</p>
<p>SUBJECT: Standardizing CADD Files</p>		<p>SCREEN/PAGE <u>1</u> OF <u>1</u></p>

**STATUTORY REFERENCE/OTHER AUTHORITY:**

**APPROVAL DATE:** April 4, 1997

**APPROVED BY:** Glenn Gershaneck, Secretary of Transportation

**PURPOSE/COMMENT:** To ensure that all exchanged CADD files utilize the same format.

**POLICY STATEMENT:** It is the policy of the Vermont Agency of Transportation to require that all electronic CADD (Computer Assisted Design & Drafting) files delivered to and taken from the Agency be in the Agency Standard format in use at that time and utilize the VAOT Naming Convention.

The Contract Administration Section will include VAOT CADD requirements in all future engineering contracts and will be responsible for publishing and maintaining them in electronic and printed form.

The Agency will enforce contract requirements by refusing to accept or pay for any CADD files relating to a project that do not meet these requirements, nor will it pay for translation to this format.

---

**POLICY HISTORY**

ORIGINAL POLICY ADOPTION DATE: 4/4/97

REVISION NO: _____	EFFECTIVE DATE: _____	REASON: _____
REVISION NO: _____	EFFECTIVE DATE: _____	REASON: _____
REVISION NO: _____	EFFECTIVE DATE: _____	REASON: _____
REVISION NO: _____	EFFECTIVE DATE: _____	REASON: _____

Figure A-43 (continued)

**Policy on Standardizing CADD Files**

**TYPE OF PROGRAM**

**MICROSTATION BINARY  
(deliverable only)**

SURVEY	
ROADWAY	
TOWN HIGHWAY BRIDGE	
INTERSTATE BRIDGES	
STATE HIGHWAY BRIDGES	
RAILROAD	
HIGHWAY CROSSINGS	
AVIATION	X
PUBLIC TRANSIT	X
BIKE & ENHANCEMENTS	
REST AREAS	
PARK & RIDE	
PAVING	X
CULVERTS	
MAINTENANCE	X
RESOURCE ID	
RIGHT OF WAY	
TRAFFIC	
CONSTRUCTION	X

Figure A-43 (continued)

**Policy on Standardizing CADD Files**

<b><u>REQUIRED DELIVERABLE</u></b>	<b>HARD COPY</b>	<b>ASCII PLOT FILE</b>
MICROSTATION / INROADS (INXPRESS)		
BINARY (created, modified, and transferred in Native Binary Format)		
X		
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
X	X	X
	X	X
	X	X
X	X	X
X	X	X
X	X	X
	X	X
	X	X
X	X	X
X	X	X
X	X	X
	X	X
	X	X
	X	X

- NOTE: 1. All projects must adhere to the deliverable requirements for the lead program in their entirety.
2. All projects engineered by local municipalities and processed at any time by the State of Vermont shall be converted at no expense to the State and delivered in MicroStation Native Binary Format.
3. All projects completely processed by local municipalities can be engineered with software at their own discretion.

Figure A-43 (continued)

## **Policy on Standardizing CADD Files**

### **CADD REQUIREMENTS**

The Vermont Agency of Transportation (the Agency) has developed these requirements to ensure that all electronic CADD files delivered to and taken from the Agency are in formats that can be utilized for engineering purposes without modification. The following will explain the requirements set forth by the Agency for developing and transferring projects in electronic formats. The Agency will not accept or pay for any CADD files relating to a project which do not adhere to these requirements. All supporting documents referenced in this document are available on the VAOT web page at <http://www.aot.state.vt.us> (170.222.64.151) and on the VAOT Bulletin Board Service at (802)828-2133.

All CADD files shall be in accordance with the attached matrix which outlines the requirements of the deliverables for the individual programs of the Agency. All projects must adhere to the deliverable requirements of the lead program in their entirety. The projects requiring a **MicroStation native binary format deliverable only** can be created and modified using any graphics software; however, the consultant shall be responsible for any and all translations, at no additional cost to the Agency, and shall be in full compliance with the VAOT CADD Standards as outlined in the appropriate program workflow for the project found on the VAOT web page at <http://www.aot.state.vt.us> (170.222.64.151). All other projects requiring **MicroStation/InRoads (InXpress) shall be created, modified, and transferred** to and taken from the Agency in MicroStation/InRoads (InXpress) native binary format. See attached matrix for additional deliverable requirements.

All CADD files shall be created and transferred to the Agency utilizing the VAOT naming convention. All consultants shall utilize a prefix of 'z' in order to distinguish the files as a consultant project. Refer to the prefix definition sheet on the VAOT web page at <http://www.aot.state.vt.us> (170.222.64.151).

Electronic files shall be transferred to and taken from the Agency in Windows or Windows NT compatible systems utilizing one of the following methods, (coordination of all file transfers shall go through the project manager):

1. all files shall be in a self-extracting compression routine as an executable and placed on diskette. Documentation of command line syntax is required for removal of files. The diskettes shall then be placed into a mail folder specifically made for transporting electronic diskettes.
2. all files shall be in a self-extracting compression routine as an executable and transferred to VAOT via File Transfer Protocol (FTP) to <ftp.cit.state.vt.us>.
3. with prior approval, data may be transferred from other platforms.  
Cartridge tapes may also be used to transfer data utilizing NT Backup.

All files shall be created from the proper VAOT Section seed file containing the correct working units for the specified design file. All VAOT seed files are available on the VAOT web page at <http://www.aot.state.vt.us> (170.222.64.151).



Figure A-43 (continued)

**Policy on Standardizing CADD Files**

**VAOT WEB PAGE AND BULLETIN BOARD DISCLAIMER:**

The files located thru this server are subject to change. The recipient will be responsible for maintaining contact with the Vermont Agency of Transportation to determine if any future VAOT changes affect the work being produced by the recipient. Although the VAOT makes every effort to ensure the accuracy of its work, it cannot guarantee that the transferred files are error free. The VAOT is not responsible in any way for costs or other consequences, whether direct or indirect, that may occur to the recipient or any subsequent users of the information due to errors, whether detected or not, that may or may not be detected.

The data conveyed to the recipient was developed for the Intergraph CADD system and there are many areas where file data cannot be made compatible with other CADD software. The recipient is responsible for determining the incompatible file data and the resolution of any incompatibilities.

Figure A-43 (continued)

**Policy on Standardizing CADD Files****Sample ASCII Plot File**

```

QUEUE=bw2_nl
VIEW=1
VOLUME=NONE
FENCE=[[22505:4:905, 51715:1:412, -50000:0:0],
      [24102:10:635, 52296:6:623, -50000:0:0],
      [23743:9:181, 53283:2:750, -50000:0:0],
      [22146:3:451, 52701:9:539, -50000:0:0],
      [22505:4:905, 51715:1:412, -50000:0:0]]
UNITS=INCHES
ORIGIN=0.000000,0.000000
XSIZE=10.191176
YSIZE=16.500000
SCALE=103.030308:1.000000
DATA_RESCALE=1.000000,1.000000
ROTATION=270.000000
PLOT_RESCALE=1.000000,1.000000
MIRROR=OFF
PROJECT=english
RENDERING_ATTRIBUTES=NONE
PEN_TABLE=/usr/vaot/env/ptb/prop200.tbl
COLOR_TABLE=e:\cmagnan\smag\misc\smag.ctb
FEATURE_TABLE=NONE
QPR_OPTIONS=[]
ENVIRONMENT=NONE
DESIGN=/loc/78f329/lf329bdr.dgn
  DISPLAY=[DIMENSION, ENTER_DATA, AREA_FILL, LEVEL_SYMBOLGY,
          LINE_STYLES, PATTERN, POINTS, WEIGHT, FILE]
  FAST=[]
  LEVELS=[1, 2, 4-18, 20-64]

REF_FILENAME[top]=lf329top.dgn
  DISPLAY[top]=[DIMENSION, ENTER_DATA, AREA_FILL, LEVEL_SYMBOLGY,
              LINE_STYLES, PATTERN, POINTS, WEIGHT, FILE]
  FAST[top]=[]
  LEVELS[top]=[1-64]

REF_FILENAME[nu1]=lf329nu1.dgn
  DISPLAY[nu1]=[DIMENSION, ENTER_DATA, AREA_FILL, LEVEL_SYMBOLGY,
              LINE_STYLES, PATTERN, POINTS, WEIGHT, FILE]
  FAST[nu1]=[]
  LEVELS[nu1]=[1-18, 20-64]

REF_FILENAME[rsc]=/ref/archive/78f329/resource/wf329rsc.dgn
  DISPLAY[rsc]=[CONSTRUCTION, ENTER_DATA, AREA_FILL,
              LEVEL_SYMBOLGY, LINE_STYLES, PATTERN, POINTS,
              WEIGHT, FILE]
  FAST[rsc]=[]
  LEVELS[rsc]=[1-64]

```

**CADD Guidelines for Paving Plans**

**Cadd Guidelines for VAOT Paving Plans**

This document is intended to establish guidelines, pertaining to cadd, for the generation of Paving Plans for the Vermont Agency of Transportation. This document is divided into two sections the first being a list of general requirements for Design Files. The second section deals with the specifics of plan generation like line weight and level assignments. If there are any questions about this document please contact the Design Section of the Pavement Management Division.

**General Information**

- All sheets for a paving project shall be in one MicroStation Design File when submitted to the Vermont Agency of Transportation.
- The name of the Design File submitted shall be the STP Project number, i.e. Project STP 9535(1)s will have a Design File name of STP9535.DGN.
- The Working Units for the Design File shall be the following:
  - English Units Design Files
    - Master Units - 1 Foot
    - Sub Units - 12 Inches
    - Positional Units - 1000
  - Metric Units Design Files
    - Master Units - 1 Meter
    - Sub Units - 1000 Millimeters
    - Positional Units - 1
- The MicroStation Level Symbology chart will be set so that the level equals the color (i.e. level 1 = color 1).
- Design files shall be provided on 3<sup>1</sup>/<sub>2</sub>" diskettes, the files can be compressed, provided the decompression utility is provided with the files.

Figure A-44 (continued)

**CADD Guidelines for Paving Plans**

- Any deviation from these guidelines shall be explained in a document to be included with the Design File upon submittal.
- A seed Design File is available with these parameters, sample sheets and details already included, the file is STPSEED.DGN from the Pavement Management Division.

**Paving Plans Information**

The following is a series of tables outlining the required attributes for a set of paving plans. The tables include Level Assignments, Saved View Names, Line Codes, Fonts, Element Weight, Text Size and Sheet Borders. Examples of Line Codes, Fonts, Element Weights and Text Size as they plot are attached at the end of this document.

**Table of MicroStation Saved View Names**

Sheet Description	Saved View Name	Remarks
Title Sheet	TI	
Index of Sheets	IN	If Required
Typical Sheet	TY	If more than 1 sheet use TY01, TY02... as needed.
Quantity Sheets	QS	If more than 1 sheet use QS01, QS02... as needed.
Item Detail Sheets	ID	If more than 1 sheet use ID01, ID02... as needed.
Layout Sheets	LA	If more than 1 sheet use LA01, LA02... as needed.
Traffic Sign Summary Sheets	TS	If more than 1 sheet use TS01, TS02... as needed.
Construction Approach Signing Sheet	CS	
Construction Detail Sheets	DT	If more than 1 sheet use DT01, DT02... as needed.

Figure A-44 (continued)

**CADD Guidelines for Paving Plans**

**Table of Level Assignments by Sheet Type**

Level Number	Description
<b>Title Sheet</b>	
18	All line work, maps, leaders and patterning.
19	All text, including corner card information.
63	Border
<b>Typical Sheet</b>	
1	All line work, including dimension lines.
2	All text, including dimensions and the corner card information.
63	Border
<b>Quantity Sheet</b>	
1	Quantity sheet # 1 text, including corner card information.
2	Quantity sheet # 2 text, including corner card information.
3 - 62	Continue above as needed.
63	Border
<b>Item Detail Sheet</b>	
1	Item Detail sheet # 1 text, including corner card information.
2	Item Detail sheet # 2 text, including corner card information.
3 - 62	Continue above as needed.
63	Border
<b>Layout Sheet</b>	
4	Center line and stationing.
10	Town and County lines.
11	Existing roadway, including side roads, approaches and drives.
12	Existing topographic features.
15	Existing utilities.
20	New drainage text.
21	Existing topographic features text.
22	New construction notes.
24	R.O.W. notes.
25	Traffic notes.
26	Utility notes.

*Figure A-44 (continued)*  
**CADD Guidelines for Paving Plans**

Level Number	Description
<b>Layout Sheet cont.</b>	
27	New roadway, including side roads, approaches and drives.
28	New drainage.
29	New utilities.
31	New miscellaneous items, i.e. guard rail and marker posts.
34	Existing structures.
35	New structures.
39	Erosion control.
40	Existing R.O.W.
41	New R.O.W.
42	Detour signs and pavement markings.
43	Existing signs.
44	New signs.
45	New pavement markings.
51	Rail road crossings.
59	Existing drainage.
62	Corner card text.
63	Border
<b>Traffic Sign Summary</b>	
<b>Sheet</b>	
1	Traffic Sign Summary sheet # 1 text, including corner card information.
2	Traffic Sign Summary sheet # 1 text, including corner card information.
3 - 62	Continue above as needed.
63	Border
<b>Construction</b>	
<b>Approach Signing</b>	
<b>Sheet</b>	
1	All line work, including dimension lines.
2	All text, including dimensions and the corner card information.
63	Border
<b>Detail Sheet</b>	
1	All line work, including dimension lines.
2	All text, including dimensions and the corner card information.
63	Border

*Figure A-44 (continued)*  
**CADD Guidelines for Paving Plans**

**Table of MicroStation Line Codes**

Line Code Number	Description
0	All new project information
2	All existing project information.
3	Dashed center line pavement markings.

**Table of MicroStation Element Weights**

Element Weight	Description
0	All existing project information including related text.
1	All new project information including related text.
4	All edge line and center line pavement markings.
5	All borders.

**Table of MicroStation Fonts, based on the VAOTFONT.RSC file.**

VAOT Font Number	Description
1	Standard font, used for all notes, labeling and dimensions.
7	Fancy font for "Proposed Improvement" and Town and County names on the Title sheet.
11	Heavy bold font for detail and sheet titles.
13	Italics font 11, optional for detail and sheet titles.
23	Italics font 1, optional for use on all notes, labeling and dimensions.
42	Outline font, optional for detail and sheet titles.
43	Optional font for use on all notes, labeling and dimensions.
60	Fixed width font, must be used for all tabular type sheets for lining up columns.

**Table of Plotted Text Sizes**

Text Size	Description
0.120	All existing project information.
0.140	All new project information.
0.280	All detail and sheet titles.

*Figure A-44 (continued)*  
**CADD Guidelines for Paving Plans**

**Table of Sheet Borders**

<b>Border File Name</b>	<b>Description</b>
CTSHEET.DGN	Use as border on Title sheet.
CBOR.DGN	Use as border on all layouts, details and miscellaneous sheets.
CFORM.DGN	Use as border on all tabular sheets that are not traffic related.
CFORMT.DGN	Use as border on all traffic related tabular sheets.



Figure A-44 (continued)

**CADD Guidelines for Paving Plans**

**Paving Plans Examples**

**Font Examples – VAOTFONT.RSC**

**Line Code Examples**

Line Code 0  
- - - - -  
Line Code 2  
- - - - -  
Line Code 3  
- - - - -

**Element Weight Examples**

Element Weight 0  
Element Weight 1  
**Element Weight 4**  
**Element Weight 5**

Font 1

**Font 7**

**Font 11**

**Font 13**

*Font 23*

**Font 42**

Font 43

FONT 60

**Text Size Examples**

Text size 0.12

Text size 0.14

Text size 0.28

Figure A-44 (continued)

**CADD Guidelines for Paving Plans**

What View Attributes should be set to in a design file.

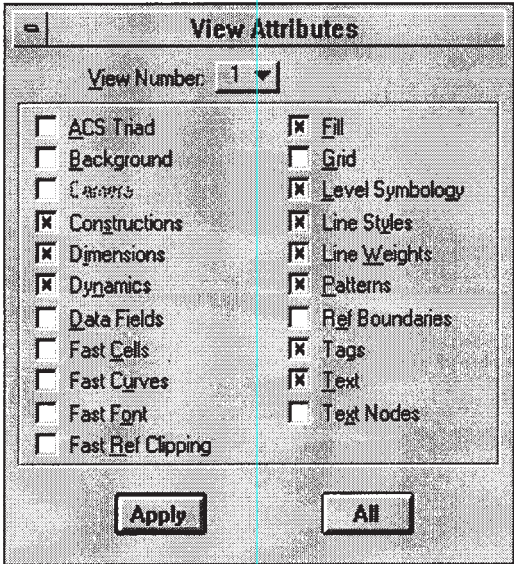


Figure A-45

**Design Computations**

**CLD**

Costello, Lomasney & deNapoli, Inc.  
 540 Commercial Street  
 Manchester, NH 03101  
 (603) 668-8223 FAX(603) 668-8802

TEM NO. 301.28

CALCULATED TDC DATE 6/18/97  
 CHECKED JK DATE 6/18/97

SUBBASE OF CRUSHED GRAVEL (FINE GRADED)

QUANTITY CONSTANT                      70 t/km/m of shldr width

Street or Route	From Sta	To Sta	Length (m)	Position	Widening (m)	Quantity (t)
VT ROUTE 9 Wilmington	2767	3190	423	Lt & Rt	1.4	41
	3190	3264	74	Lt & Rt	3.3	17
	3264	3647	383	Lt & Rt	1.2	32
	3669	3753	84	Lt & Rt	1.2	7
	3753	3863	110	Lt	0.3	2
	3753	3863	110	Rt	0.9	7
	3863	4247	384	Lt & Rt	1.2	32
	4247	4578	331	Lt	0.9	21
	4400	4578	178	Rt	0.3	4
	4578	4663	85	Lt & Rt	2.4	14
					Subtotal	
@ ADA Ramps See Item Detail Sheet For Locations					Subtotal	40 t
					Subtotal	217 t
					Rounding	3 t
					Total	220 t
						Estimated

Figure A-45 (continued)

**Design Computations**

**CLD**

Costello, Lomasney & deNapoli, Inc.

540 Commercial Street

Manchester, NH 03101

(603) 668-8223 FAX(603) 668-8802

ITEM NO 402.12

CALCULATED smc DATE 5/97  
 CHECKED TLS DATE 5/6.97

Aggregate Shoulders

QUANTITY CONSTANT 22 t/km/side plus

To Backup the Edge of Pavement

Location	From Sta	To Sta	Length (m)	Position	Quantity (t)
	2767	3190	846	Lt & Rt	19
	3190	3264	148	Lt & Rt	3
	3264	3647	766	Lt & Rt	17
	3669	3753	168	Lt & Rt	4
	3753	3863	110	Lt	2
	3753	3863	110	Rt	2
	3863	4247	768	Lt & Rt	17
	4247	4578	331	Lt	7
	4400	4578	178	Rt	4
	4578	4663	170	Lt & Rt	4
	Total Length		2916		
				Subtotal	79 t
				Rounding	1 t
				Total	80 t

Revisions to this quantity affect:

Figure A-45 (continued)  
**Design Computations**

96-309 (Wilmington) Spreadsheets.xlw

**CLD**

Costello, Lomasney & deNapoli, Inc.  
 540 Commercial Street  
 Manchester, NH 03101  
 (603) 668-8223 FAX(603) 668-8802

ITEM NO. 404.65

CALCULATED SMC DATE 5/197  
 CHECKED JUS DATE 5/6/97

EMULSIFIED ASPHALT

AREA OF LIFT TAKEN FROM 406.25, BITUMINOUS CONCRETE PAVEMENT

	# OF APPLIC.	AREA OF EA LIFT (m2)	TOTAL AREA	
AREA OF OVERLAY	2	11090	22180	m2
AREA OF COLDPLANE	2	13170	26340	m2
AREA OF RECLAIM	0	0	0	m2
			SUBTOTAL	48520 m2
APPLIED AT THE RATE OF ASPHALT QUANTITY IN LITERS	0.070	L/m2	3396.40	L
WEIGHT / LITER OF ASPHALT	1.0	kg/L	3396.40	kg
ASPHALT QUANTITY IN kg				
			SUBTOTAL	3396.40 kg
			ROUNDING	<del>34.00</del> kg <u>33.60</u>
			TOTAL	3430 kg

Changes to this item effect:  
 406.25 - Bituminous Concrete Pavement

Figure A-45 (continued)

**Design Computations**

96-309 (Wilmington) Spreadsheets.xlw

**CLD**

Costello, Lomasney & deNapoli, Inc.  
 540 Commercial Street  
 Manchester, NH 03101  
 (603) 668-8223 FAX(603) 668-8802

ITEM NO. 406.25

CALCULATED TRC DATE 6/15/97  
 CHECKED IB DATE 6/18/97

BITUMINOUS CONCRETE PAVEMENT (PG 64-22)

QUANTITY	UNIT	LOCATION
2331	ton	Wearing Course
1060	ton	Leveling Course
43	ton	Side Roads
67	ton	Drives
3501	ton	Subtotal
49	ton	Rounding
3550	ton	Total

CHANGES TO THIS ITEM EFFECT:  
 TRAFFIC OFFICERS  
 TRAFFIC OFFICERS W/ LIGHT  
 FLAGGERS  
 PRICE ADJUSTMENT ASPHALT CEMENT

Figure A-45 (continued)

**Design Computations**

96-309 (Wilmington) Spreadsheets.xlw

\*\*\*\*\* MAINLINE PAVEMENT QUANTITIES \*\*\*\*\*

AREA OF OVERLAY

Location	Sta from	Sta to	Length (m)	Width (m)	Area (m2)
Vt Route 9	2791	3190	399	8.0	3192
Wilmington	3190	3264	74	10.0	740
	3264	3647	383	7.8	2987
Br #30	3647	3669	22	7.0	154
	3669	4184	515	7.8	4017
		Total Length	1393 m	Subtotal	11090 m2
				Depth of Overlay	40 mm
				Depth of Base Course	0 mm
				Volume	444 m3
				Quantity @ 2.4 ton/m3	1066 ton

Figure A-46

**Special Provision Requirements**

---

**webster-martin, inc.**

**MEMORANDUM**

---

1025 Airport Drive, P.O. Box 2246  
South Burlington, VT 05407

---

Telephone: 802-864-0223  
Fax: 802-864-0165

---

To: E. Mark Woolaver, VAOT Pavement Management

From: John Little

Date: June 12, 1997

Subject: STP 9663(1)S Richford State Numbered T.H. 139  
Request for work order for American work crew in Canada

Distribution: File 04-9517; Greg Edwards, W-M

---

Mark:

The following references a telephone conversation I had with Pierre Guillemette, Canadian Customs on April 3, 1997. This information is for your use in the Special Provisions as you see fit:

Transport Quebec has no problem with the proposed placement of the Construction Approach Signing on the Canadian side of the border. In order to get these signs installed by an American construction crew, however, a work order must first be obtained from Canadian Immigration. Although this is not a complicated procedure, it is a necessary one.

The Canadian Immigration office is located in Philipsburg, Quebec, at the Highgate, VT crossing. They can be reached at (514) 248-2411.

The contact person at Transport Quebec is:

Yvon Fornand (514) 539-1426

C:\paving\stp9663\wrkorder.wpd



Figure A-46 (continued)

**Special Provision Requirements**

To: E. Mark Woolaver, VAOT Pavement Management

Date: June 12, 1997

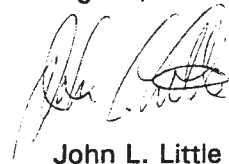
Page 2

If further assistance is required, please contact:

Pierre Guillemette, Canadian Customs (514) 292-5995

Please don't hesitate to call with any questions or comments.

Signed,

A handwritten signature in black ink, appearing to read "John L. Little". The signature is stylized and somewhat cursive.

John L. Little

C:\paving\stp9663\wrkorder.wpd

Figure A-46 (continued)  
Special Provision Requirements

---

**webster-martin, inc.**

**MEMORANDUM**

---

1025 Airport Drive, P.O. Box 2246  
South Burlington, VT 05407

---

Telephone: 802-864-0223  
Fax: 802-864-0165

---

To: E. Mark Woolaver, VAOT Pavement Management

From: John Little

Date: June 12, 1997

Subject: Richford STP 9663(1)S Modified Items

Distribution: File 04-9517; Greg Edwards, W-M

---

**Mark:**

The following are the modified items for the above referenced project and an explanation of those modifications.

**Item 621.20 Steel Beam Guard Rail (Mod.)**

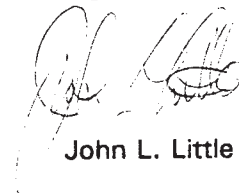
This item is modified to reflect the use of 2.4 meter long posts.

**Item 641.10 Traffic Control (Mod.)**

This item is modified to pay for the French Construction Approach Signing required North of the end of this project. It will include the signs (SM), posts (kg), their installation and their removal.

Please don't hesitate to call with any questions or comments.

Signed,



John L. Little

C:\paving\stp9663\modified.wpd

Figure A-47

**Railroad Crossing Memorandum**

**AGENCY OF TRANSPORTATION**

**OFFICE MEMORANDUM**

---

**PAVEMENT MANAGEMENT SECTION**

---

**TO:** Richard Bowen, Rail - Highway Crossing Coordinator

**FROM:** E.Mark D. Woolaver, Pavement Design Engineer

**DATE:** June 16, 1996

**SUBJECT:** 1998 and 1999 Paving Projects  
RR Crossing Treatments

Attached is a list of Rail-Highway crossings associated with our summer of 1998 and summer of 1999 paving programs. Should we desire any improvements to occur to these crossings in conjunction with a paving project, please contact any affected railroad to determine the appropriate treatment (ie. railseal, elastomeric crossing, new ties, rails, ...) and the party responsible for construction (ie. railroad forces or State Contractor). Once notified by you, we can incorporate the appropriate details into our project plans and can commence the RR agreement process unless you notify that you require further involvement.

Please note that our Contract Plan deadline for our summer 1998 projects is January 1998 and for summer 1999 projects is July 1998. This is a fairly aggressive schedule and all rail information must be received well in advance of those dates in order to have it successfully incorporated into our project plans.

Please call with any questions or concerns. I may be reached at 3578.

EMW:Attachments

cc: Design Files (6)  
Central files  
PM File  
RR File via EMW

Figure A-48

**Recommendation for Categorical Exclusion**



STATE OF VERMONT  
 AGENCY OF TRANSPORTATION  
 133 State Street, Administration Building  
 Montpelier, Vermont 05633-5001



May 16, 1997

Mr. Rob Sikora  
 Environmental Program Manager  
 Federal Highway Administration  
 PO Box 568  
 Montpelier, Vermont 05601

<b>Re: Berlin</b>	<b>STP 9666(1)S</b>	<b>VT 62</b>
<b>Berlin (+ One-way)</b>	<b>STP 9515(1)S</b>	<b>BSH</b>
<b>Cabot-Danville</b>	<b>NH 9660(1)</b>	<b>US 2</b>
<b>Newport</b>	<b>STP 9651(1)</b>	<b>US 5</b>

Dear Mr. Sikora:

The project locations, descriptions of work and current traffic data for the above mentioned paving projects are on the attached title pages.

We recommend that these projects be classified as Categorical Exclusion pursuant to Chapter Five of the Vermont Agency of Transportation's Action Plan and 23 CFR 771.117(d) (1) "Environmental Impact and Related Procedures - Categorical Exclusions" as these projects consist of modernization of a highway by resurfacing.

These projects will pave the existing number of lanes on the respective highways. Any deviation from standards will be approved in advance by the Federal Highway Administration unless exempted by the exempt provisions of the Intermodal Surface Transportation Efficiency Act of 1991.

These projects will not involve substantial planning, resources, nor expenditures. They are not likely to induce significant alterations in land use, planned growth, development patterns, traffic volumes or traffic patterns, nor have effect on natural and cultural resources. No significant environmental impact is foreseen as resulting from project activities. See the attached "Categorical Exclusion Worksheets" for specific compliance.

No property protected under the provisions of Section 4(f) of the Department of Transportation Act of 1966 or Section 6(f) of the Land & Water Conservation Fund Act of 1965 will be impacted. These projects also do not effect historic or prehistoric resources protected by Section 106 of the National Historic Preservation Act of 1966.

No endangered or threatened species or their habitat protected under the provisions of the Endangered Species Act of 1973 have been identified in the project area.

No hazardous wastes liabilities under the Comprehensive Environmental Response, Compensation

Telecommunications Relay Service 1-800-253-0191  
 Vermont is an Equal Opportunity Employer.

Figure A-48 (continued)

**Recommendation for Categorical Exclusion**

Mr. Sikora  
May 16, 1997  
Berlin STP 9666(1)S  
Berlin (+ One-way) STP 9515(1)S  
Cabot-Danville NH 9660(1)  
Newport STP 9651(1)

and Liability Act of 1980 have been identified in the project area.

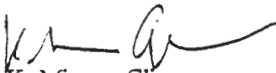
No wetlands protected under Executive Order 11980 of 1977 will be affected.

No actions by other Federal Agencies will be required in the development of these projects.

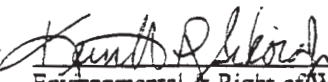
No public hearing or hearing opportunities pursuant to the Vermont Action Plan and 23 CFR 771.111(h) "Early coordination, public involvement and project development" is required for these projects. However, each community has been notified of the projects by letter or "kick-off" meeting. These projects will not involve significant amounts of right-of-way, substantially change the layout or functions of connecting roadways or of the facility being improved, have a substantial adverse impact on abutting property, or otherwise have a significant social, economic, environmental or other effect.

Please contact us if you need more information.

Sincerely,

  
K. Micque Gittman  
Director of Planning

Endorsement to the Vermont Agency of Transportation

Concur  \_\_\_\_\_ 6/3/97  
Environmental & Right of Way Manager Date

Attachments

c: David S. Marshall, PE, Civil Engineering Associates  
Mike Hedges, Pavement Management Engineer  
Planning Files, Via JHP  
Project Development Files via JTN  
Marv Kingsbury, Programming  
Al Blake, ROW  
Gary Dubray, Contract Administration  
*Central files*

Figure A-49

**Transmittal Request for Prints**

**"Work Request Transmittal Form"**

To: Reprographics

From: Individual's Name \_\_\_\_\_

Division/Squad \_\_\_\_\_

Phone Number \_\_\_\_\_

Project Name and Number \_\_\_\_\_

EA Number \_\_\_\_\_

Date Ordered: \_\_\_\_\_

Date Received: \_\_\_\_\_

Date Required: \_\_\_\_\_

**Note:** Has "rp\_iparm" been executed? \_\_\_\_\_  
(Yes or No)

Please process the following work request. The text file containing the complete list of sheets is (full path and filename): \_\_\_\_\_

The sheets that require scanning are attached.

Type of Plans:    Conceptual - Preliminary - Semi-Final  
(Circle one)        Final - Contract Plans - Other

Number of Half-size Sets = \_\_\_\_\_  
Number of Full-size Sets = \_\_\_\_\_

Any special instructions?? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*\*\*\*\*

\* **For Reprographics Use:**

\*  
\* # of scanned sheets \_\_\_\_\_  
\* # of CADD sheets \_\_\_\_\_  
\* # of standards \_\_\_\_\_  
\*  
\*                    Total        -----

3 full size sets of standards completed \_\_\_\_\_

\* Scanned: \_\_\_\_\_  
\* Submitted to Indigo: \_\_\_\_\_  
\* Completed: \_\_\_\_\_

Archived to "isrv01"  
Date: \_\_\_\_\_  
Directory: /usr/repro/archive/ \_\_\_\_\_

Figure A-50

### TRANSPORT Estimate

VERMONT AGENCY OF TRANSPORTATION  
DETAIL COST ESTIMATE

ESTIMATE NUMBER : 96C126

PROJECT NUMBER : BARTON #STP 9713(1)S

PROJECT NAME :  
BARTON #STP 9713(1)S

TOTAL PROJECT LENGTH : 6.2492 KILOMETERS

TOTAL BRIDGE LENGTH : 0.0000 METERS

COUNTIES : ORLEANS

DATE PRINTED : 05/21/97

PCN	FEDERAL/STATE PROJECT NUMBER	DATE ESTIMATE	DATE REVISED	PREPARED BY
96C126	BARTON #STP 9713(1)S	01/21/97	05/21/97	PAVEMENT MANAGEMENT

Figure A-50 (continued)  
**TRANSPORT Estimate**

VERMONT AGENCY OF TRANSPORTATION  
PROJECT SUMMARY LOG

DATE : 05/21/97  
PAGE : 1

PCN	DESCRIPTION	FEDERAL/STATE PROJECT NUMBER	DETAIL	SOURCE
96C126	COLD MIX RECYCLING OF THE TRAVEL LANES, EXCAVATION & PAVING O	BARTON #STP 9713(1)S	Y	P



Figure A-50 (continued)

**TRANSPORT Estimate**

VERMONT AGENCY OF TRANSPORTATION  
 DETAIL COST ESTIMATE

05/21/97  
 PAGE NO. 1

ESTIMATE NUMBER : 96C126 PCN : 96C126 PROJECT NO. : BARTON #STP 9713(1)S CONTRACT ID :

PCN : 96C126 COLD MIX RECYCLING OF THE TRAVEL LANES, EXCAVATION & PAVING OF  
 F TH SHOULDERS, RESURFACING OF ENTIRE ROAD, GUARDRAIL, DRAINAGE

CATEGORY : 1011 ROADWAY  
 FUNDING SOURCE(S) AND PARTICIPATION : FED81 81.08% FEDERAL FUNDING PARTICIPATION 81.08 %  
 ST19 18.92% STATE FUNDING PARTICIPATION 18.92 %

CONSTRUCTION TYPE : NA NOT APPLICABLE # OF SPANS : 0 BRIDGE ID : NA  
 WORK CLASSIFICATION : 1000 ROADWAY SPAN LENGTH : 0.0000 CAT LENGTH : 6.2492 KILOMETERS  
 CONSTRUCTION CLASS : COMP COMPOSITE SPAN WIDTH : 0.0000 CAT WIDTH : 12.2000 METERS

LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	ESTIMATED QUANTITY	ITEM UNIT	UNIT PRICE	AMOUNT
0005	203.28	EXCAVATION OF SURFACES AND PAVEMENTS	2,500.000	CM	14.00000	35,000.00
0007	203.30	EARTH BORROW	560.000	CM	10.00000	5,600.00
0010	204.20	TRENCH EXCAVATION OF EARTH (N. A. B. I.)	0.500	CM	13.00000	6.50
0015	210.10	COLD PLANING-BIT-PAVEMENT	610.000	SM	7.00000	4,270.00
0020	301-28	SUBBASE OF CRUSHED GRAVEL (FINE-GRADED)	1.000	T	15.00000	15.00
0025	402.12	AGGREGATE SHOULDERS	275.000	T	13.00000	3,575.00
0030	404.65	EMULSIFIED ASPHALT	7,525.000	KG	0.45000	3,386.25
0031	404.65	EMULSIFIED ASPHALT (MODIFIED)	162,000.000	KG	0.55000	89,100.00
0035	406.30	SUPERPAVE BITUMINOUS CONCRETE PAVEMENT (PG 58-34)	16,200.000	T	44.00000	712,800.00
0037	406.50	PRICE ADJUSTMENT ASPHALT CEMENT (N.A.B.I.)	0.500	LU	1.00000	0.50
0039	415.20	COLD MIXED RECYCLED BITUMINOUS PAVEMENT	45,000.000	SM	2.25000	101,250.00
0047	604-412	REHABING DI CB OR MH CLASS I	2.000	EACH	900.00000	1,800.00
0048	604-415	REHABING DI CB OR MH CLASS II	3.000	EACH	1,100.00000	3,300.00
0049	604-418	REHABING DI CB OR MH CLASS III	3.000	EACH	1,200.00000	3,600.00
0050	608.15	POWER GRADER RENTAL	95.000	HR	45.00000	4,275.00
0055	608.25	ALL PURPOSE EXCAVATOR RENTAL, TYPE I	95.000	HR	75.00000	7,125.00
0060	608.30	POWER BROOM RENTAL	65.000	HR	25.00000	1,625.00
0065	608.37	TRUCK RENTAL	95.000	HR	35.00000	3,325.00
0070	608.40	LOADER RENTAL, TYPE I	95.000	HR	35.00000	3,325.00
0072	619.17	YIELDING MARKER POSTS	58.000	EACH	15.00000	870.00
0075	621.20	STEEL BEAM GUARD RAIL	760.000	M	31.00000	23,560.00
0076	621.20	STEEL BEAM GUARD RAIL (MOD) (H/2.4M STEEL POSTS)	16.000	M	35.00000	560.00
0078	621.21	HEAVY DUTY STEEL BEAM GUARD RAIL	160.000	M	45.00000	7,200.00
0080	621.54	MODIFIED ECCENTRIC LOADER TERMINAL	24.000	EACH	1,000.00000	24,000.00
0082	621.60	ANCHOR FOR STEEL BEAM RAIL	4.000	EACH	400.00000	1,600.00
0085	621.80	REMOVAL AND DISP OF GUARD RAIL	930.000	M	3.00000	2,790.00
0087	621.81	REMOVAL AND DISP OF GUIDE POSTS	2.000	EACH	15.00000	30.00
0090	630.10	UNIFORMED TRAFFIC OFFICERS (N.A.B.I.)	780.000	HR	40.00000	31,200.00
0095	630.15	FLAGGERS (N.A.B.I.)	625.000	HR	12.00000	7,500.00
0100	635.10	MOBILIZATION	0.500	LUMP	85.000.00000	42,500.00
0105	646.40	DURABLE 100 MM WHITE LINE	12,500.000	M	1.00000	12,500.00
0110	646.41	DURABLE 100 MM YELLOW LINE	7,400.000	M	1.00000	7,400.00
0125	646.60	TEMPORARY 100 MM WHITE LINE	12,500.000	M	0.16000	2,000.00

Figure A-50 (continued)

**TRANSPORT Estimate**

05/21/91  
PAGE NO. 2

VERMONT AGENCY OF TRANSPORTATION  
DETAIL COST ESTIMATE

ESTIMATE NUMBER : 96C126 PCN : 96C126 PROJECT NO. : BARTON #STP 9713(1)S CONTRACT ID :

PCN : 96C126 COLD MIX RECYCLING OF THE TRAVEL LANES, EXCAVATION & PAVING OF  
F TH SHOULDERS, RESURFACING OF ENTIRE ROAD, GUARDRAIL, DRAINAGE

CATEGORY : 1011 ROADWAY

LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	ESTIMATED QUANTITY	ITEM UNIT	UNIT PRICE	AMOUNT
0130	646.61	TEMPORARY 100 MM YELLOW LINE	7,400.000	M	0.16000	1,184.00
0140	646.76	LINE STRIPING TARGETS	525.000	EACH	1.00000	525.00
0145	651.15	SEED	15.000	KG	20.00000	300.00
0150	651.18	FERTILIZER	115.000	KG	3.00000	345.00
0155	651.20	AGRICULTURAL LIMESTONE	1.000	T	250.00000	250.00
0160	651.25	HAY MULCH	1.000	T	400.00000	400.00
0165	651.35	TOPSOIL	20.000	CM	40.00000	800.00
0170	675.20	TRAFFIC SIGNS, TYPE A	4.900	SM	150.00000	735.00
0175	675.30	FLANGED CHANNEL SIGN POSTS (BEGIN OPTION ITEMS)	228.000	KG	5.00000	1,140.00

AA1	0180	675.34	SQUARE TUBE STEEL POSTS AND ANCHORS (END OPTION ITEMS)	228.000	KG	5.00000	1,140.00
AA2	0185	675.50	REMOVING SIGNS	16.000	EACH	4.00000	64.00
	0190	675.60	ERECTING SALVAGED SIGNS	4.000	EACH	10.00000	40.00

X EXCLUDED FROM CATEGORY TOTAL

----- CATEGORY TOTAL \$ 1,152,871.25

CATEGORY : 1031 EMPLOYEE TRAINEESHIP  
FUNDING SOURCE(S) AND PARTICIPATION : FEB81 81.08% FEDERAL FUNDING PARTICIPATION 81.08 %  
ST19 18.92% STATE FUNDING PARTICIPATION 18.92 %

CONSTRUCTION TYPE : NA NOT APPLICABLE BRIDGE ID : MA  
WORK CLASSIFICATION : Y0B0 TRAINING SPAN LENGTH : 0.0000 CAT LENGTH : 0.0000 KILOMETERS  
CONSTRUCTION CLASS : COMP COMPOSITE SPAN WIDTH : 0.0000 CAT WIDTH : 0.0000 METERS

LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	ESTIMATED QUANTITY	ITEM UNIT	UNIT PRICE	AMOUNT
0195	634.10	EMPLOYEE TRAINEESHIP	520.000	HR	3.00000	1,560.00
----- CATEGORY TOTAL						\$ 1,560.00

Figure A-50 (continued)

**TRANSPORT Estimate**

05/21/97  
PAGE NO. 3

VERMONT AGENCY OF TRANSPORTATION  
DETAIL COST ESTIMATE

ESTIMATE NUMBER : 96C126 PROJECT NO. : BARTON #STP 9713(1)S CONTRACT ID :

PCN : 96C126 COLD MIX RECYCLING OF THE TRAVEL LANES, EXCAVATION & PAVING OF  
F TH SHOULDERS, RESURFACING OF ENTIRE ROAD, GUARDRAIL, DRAINAGE

CATEGORY : 1211 BRIDGE  
FUNDING SOURCE(S) AND PARTICIPATION : FED81 81.08% FEDERAL FUNDING PARTICIPATION 81.08 %  
ST19 18.92% STATE FUNDING PARTICIPATION 18.92 %

CONSTRUCTION TYPE : NA NOT APPLICABLE CAT LENGTH : 0.0000 KILOMETERS  
WORK CLASSIFICATION : 3J UPGRADE TO BRIDGE APPROACH RAIL CAT WIDTH : 0.0000 METERS  
CONSTRUCTION CLASS : COMP COMPOSITE

LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	ESTIMATED QUANTITY	ITEM UNIT	UNIT PRICE	AMOUNT
0005	501.22	CONCRETE, CLASS A	1.000	CM	1,000.00000	1,000.00
0010	507.15	REINFORCING STEEL	100.000	KG	2.00000	200.00
0012	525.10	REMOVAL OF EXISTING RAILING	70.000	M	10.00000	700.00
0015	525.40	BRIDGE RAILING - HD STEEL BEAM/CURB MOUNTED (M00 2)	100.000	M	70.00000	7,000.00
0020	529.25	REMOVAL OF CONCRETE OR MASONRY	1.000	CM	1,000.00000	1,000.00
CATEGORY TOTAL						\$ 9,900.00

CATEGORY : 1999 FULL E&C ITEMS  
FUNDING SOURCE(S) AND PARTICIPATION : FED81 81.08% FEDERAL FUNDING PARTICIPATION 81.08 %  
ST19 18.92% STATE FUNDING PARTICIPATION 18.92 %

CONSTRUCTION TYPE : NA NOT APPLICABLE CAT LENGTH : 0.0000 KILOMETERS  
WORK CLASSIFICATION : CENG FULL-E+C ITEMS AMOUNT (ENGIN. & CONTIN.) CAT WIDTH : 0.0000 METERS  
CONSTRUCTION CLASS : COMP COMPOSITE

LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	ESTIMATED QUANTITY	ITEM UNIT	UNIT PRICE	AMOUNT
0005	631.10	FIELD OFFICE-ENGINEERS	1.000	LUMP	10,000.00000	10,000.00
0010	631.16	TESTING EQUIPMENT - CONCRETE	0.600	LUMP	750.00000	450.00
0015	631.17	TESTING EQUIPMENT - BITUMINOUS	0.500	LUMP	500.00000	250.00
0020	631.25	FIELD OFFICE - TELEPHONE (N.A.B.1.)	1.000	LU	700.00000	700.00
CATEGORY TOTAL						\$ 11,400.00
PROJECT TOTAL						\$ 1,175,731.25
ESTIMATE TOTAL						\$ 1,175,731.25

Figure A-50 (continued)  
**TRANSPORT Estimate**

DATE PRINTED : 05/21/97

VERMONT AGENCY OF TRANSPORTATION  
 DETAIL ESTIMATE COST SUMMARY

ESTIMATE NUMBER : 96C126      PROJECT NO.: BARTON #STP 9713(1)S

PROJECT NO.	PCN	STAT TYPE	COST	CONST ENGR	TOTAL	FUNDING LIMIT	FUNDING
FUND CLASS FED81 81.08% FEDERAL FUNDING PARTICIPATION							
BARTON #STP 9713(1)S	96C126	ADV SR	1,175,731.25	93,146.50	1,268,877.75	0.00	1,028,806.08
FUND CLASS FED81 TOTALS			1,175,731.25	93,146.50	1,268,877.75	0.00	1,028,806.08
FUND CLASS ST19 18.92% STATE FUNDING PARTICIPATION							
BARTON #STP 9713(1)S	96C126	ADV SR	1,175,731.25	93,146.50	1,268,877.75	0.00	240,071.67
FUND CLASS ST19 TOTALS			1,175,731.25	93,146.50	1,268,877.75	0.00	240,071.67
ESTIMATE TOTALS			1,175,731.25	93,146.50	1,268,877.75	0.00	1,268,877.75

Figure A-51

**Financing Memorandum**

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

PAVEMENT MANAGEMENT SECTION

**TO:** Gary Dubray, Contract & Specifications Engineer  
**FROM:** Wm. Michael Hedges, P.E., Pavement Management Engineer  
**DATE:** September 5, 1997  
**SUBJECT:** Pavement Management Project  
**RE:** **Sheffield, Glover & Barton IM 091-3(9)**

The project is not separately identified in the Capital Program and Project Development Plan for Fiscal Year 1998. It is included in the information on page 1. A copy of that page is attached. This particular funding is for paving type projects, which this project is of that type.

Additionally, attached is the map from the proposed summer 1997 Paving Program.

The AID numbers for this project is :

Federal	937060
State	211037
Local	215517

The Stars appropriation code is : 107

WMH:lcs

c: Design File  
PM File

stars.mem

Figure A-52

**Form CA-52, Construction Project Cost Allocation**

STATE OF VERMONT - AGENCY OF TRANSPORTATION CONSTRUCTION PROJECT - COST ALLOCATION FORM CA - 52 11/95				
PROJECT NAME: <b>SHEFFIELD, GLOVER &amp; BARTON</b>		NUMBER(S): <b>IM 091-3(9)</b>		
EA/SUB JOB NUMBER(S): <b>97A018</b>				
AID NUMBER(S): <b>FEDERAL - 937060      STATE - 211037      LOCAL - 215517</b>				
COUNTY: <b>03 &amp; 10</b>	ROUTE: <b>INTERSTATE 91</b>	LENGTH: <b>8529.52 METERS</b>	DISTRICT: <b>09</b>	STARS UNIT CODE: <b>6350</b>
LOCATION: BEGINNING AT STATION 242+528.14 (MM 150.700) ON THE SOUTHBOUND LANE IN THE TOWN OF SHEFFIELD AND EXTENDING NORTHERLY ALONG INTERSTATE 91, A DISTANCE OF 8529.52 METERS (5.300 MILES) TO STATION 251+057.66 (MM 156.000) ON THE SOUTHBOUND LANE IN THE TOWN OF BARTON AT EXIT 25.				
DESCRIPTION OF WORK: WORK TO BE PERFORMED UNDER THIS PROJECT INCLUDES COLD PLANING THE SOUTHBOUND LANE, RESURFACING OF THE EXISTING HIGHWAY WITH A LEVELING COURSE, WEARING COURSE, AND NEW PAVEMENT MARKINGS.				
REQUESTED BY: <i>(Project Mgr Sig)</i>		APPROVED BY: <i>(Div Director Sig)</i>		
DATE:		DATE:		
PROJECT COST BREAKDOWN (To be completed by Contract Administration)				
DESCRIPTION	TOTAL COST	FEDERAL FUNDS	STATE FUNDS	LOCAL FUNDS
PE				
ROW				
CNSTR				
CNST ENG				
TOTAL ESTIMATED COST				
STATE FUNDS AVAILABLE (SIGNATURE)		FEDERAL FUNDS AVAILABLE (SIGNATURE)		
BUDGET & LEGISLATIVE RELATIONS CHIEF DATE:		PROGRAMMING ENGINEER DATE:		
RECOMMENDED FOR APPROVAL (SIGNATURE)		RECOMMENDED FOR APPROVAL (SIGNATURE)		
DIRECTOR OF ADMINISTRATION DATE:		SECRETARY OF TRANSPORTATION DATE:		

Figure A-53

**Project Advertising Memorandum**

AGENCY OF TRANSPORTATION	OFFICE MEMORANDUM
PAVEMENT MANAGEMENT SECTION	
<b>TO:</b>	Stephen P. O'Connor, Chief of Contract Administration
<b>FROM:</b>	Les S. Wilder, Pavement Design Tech.
<b>DATE:</b>	8 July 1997
<b>SUBJECT:</b>	FFY97 Project Plans
<b>RE:</b>	<b>Colchester IM 089-3(29)</b>
<p>Attached are reprographics produced half size set of plans, an original signed title sheet, and two Bams estimates for the subject project. The HighEst estimate and cover sheet have been transferred to isrv01 under the path autoserv/userdisk/contract/ common/ estimate/ 97a050.he, and 97a050.ti, respectively.</p> <p>Also included is a signed form CA-52 with cover memo, appropriate pages from the Capital Program Report, appropriate paving maps, ROW clearance memo and a copy of the print request text file.</p> <p>A Categorical Exclusion has been included.</p> <p>Please commence the PS &amp; E, advertisement, and award process for construction during FFY97.</p> <p>LSW Attachments</p> <p>c: M&amp;R Engineer Cauley Utilities Engineer Wright Reg. Construction Engineer Dunn DTA #5, Hosking Traffic Operations Technician Winters Programming Engineer Kingsbury (w/est.) Design File via MacArthur Central files PM File</p>	

Figure A-54

**Bid Analysis and Recommendation**

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

\*\*\*\*\*

CONSTRUCTION & MAINTENANCE

TO: Glenn Gershaneck, Secretary  
FROM: Gordon B. MacArthur, Director

DATE: Feb 26, 1997

SUBJECT: Bid Analysis

PROJECT: Newark STP9517 (1)S

CONTRACTOR: Pike Industries

BID OPENING DATE: Feb 14, 1997

ANALYSIS BY: Carol Zylinder ANALYSIS DATE: Feb 26, 1997

Bids submitted for this contract have been reviewed for reasonable conformance with the engineer's estimated prices, resulting in the following recommendation.

The bid should be accepted. Analysis has failed to indicate an advantage to the contractor with corresponding disadvantage to the State.

The bid should be rejected for the following reason(s):

402.12 est @ \$13.00/ton bid @ \$20/ton. Quantities look good  
621.20 est @ \$10.00/meter bid @ \$29.50/meter. \$10/meter is too low - our error  
406.27 est @ \$38/ bid @ 44.25. + \$38 750. Quantity OK

DIVISION HEAD SIGNATURE: G. Mitchell Hedges DATE: 2/26/97

DIRECTOR OF CONST. & MAINT.: G.B. MacArthur DATE: 2/28/97

Attachment

cc: Central Files  
Kevin Clairmont, Contract Administration

APPROVED: Glenn Gershaneck  
Glenn Gershaneck, Secretary of Transportation

Date: 3/6/97





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