This report was sponsored by the New England Transportation Consortium, a cooperative effort of the Departments of Transportation and the Land Grant Universities of the six New England States, and the U.S. Department of Transportation's Federal Highway Administration.

The contents of this report reflect the views of the author(s) who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Departments of Transportation or the Land Grant Universities of the six New England States, or the U.S. Department of Transportation's Federal Highway Administration. This report does not constitute a standard, specification, or regulation.
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A. INTRODUCTION

The New England Transportation Consortium (NETC) is a cooperative effort of the transportation agencies of the six New England States. Through the Consortium, the states pool professional, academic and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation and maintenance of the region’s transportation system.

B. 2001 HIGHLIGHTS

1. FUNDING APPROVED FOR NEW RESEARCH TO ADDRESS EIGHT HIGH PRIORITY REGIONAL TRANSPORTATION RESEARCH NEEDS: The NETC Policy Committee, upon recommendation of the Advisory Committee, approved eight research projects, totaling $615,000 to address high priority regional transportation research needs. The New York State Department of Transportation is collaborating with NETC on the funding of five of the projects.
   - Relating Hot Mix Asphalt Pavement Density to Performance
   - Formulate an Approach for 511 Implementation in New England
   - Establish Subgrade Support Values (M_r) for Typical Soils in New England
   - Real-Time Priority Based Statewide Bridge Scour Assessment System
   - Determination of Moisture Content of Deicing Salt at Point of Delivery
   - Sealing of Expansion Joints
   - Calibrating Traffic Simulation Models to Inclement Weather Conditions with Applications to Arterial Coordinated Signal Systems
   - Intelligent Transportation System Applications to Ski Resorts in New England

2. FINDINGS FROM THREE RESEARCH PROJECTS DISTRIBUTED: Final reports for the following projects were published and distributed to New England’s State transportation agencies and universities, the Federal Highway Administration, and the AASHTO Region 1 Research Advisory Committee:
   - NETC 95-3: “Implementation and Evaluation of Traffic Marking Recesses for the Application of Thermoplastic Pavement Markings on Modified Open-Graded Hot Mix Asphalt Pavement”
   - NETC 97-3: “Properties, Standards and Performance of Wood Waste Compost as an Erosion Control Mulch and as a Filter Berm”

3. TECHNOLOGY TRANSFER:
   - 34 Requests for NETC Research Project Reports were Processed: The requests were received from a variety of sources including the following: the Coalition of Northeast Governors, the California, New York, Louisiana, New Jersey, Maryland, Ohio Departments of Transportation, the US Department of Agriculture Natural Resources Conservation Service, the Ministry of Transport of the Province of Ontario Canada, the Asphalt Institute, Worcester Polytechnic Institute, University of Mining & Metallurgy of Cracow Poland, Erosion Control Magazine, and a number of...
- **Presentations at Meetings/Conferences:**
  a. **Annual Visit of Transportation Research Board Representative:** the NETC Coordinator made a presentation on the Consortium’s mission, organization, project selection procedures and current research projects, at the annual visit of the Transportation Research Board representative to the Connecticut Transportation Institute at the University of Connecticut on June 4, 2001.
  b. **American Association of State Highway Transportation Officials Annual Meeting:** The NETC Coordinator presented an exhibit of NETC research projects at the ASSHTO Annual Meeting held in Fort Worth, Texas in December, 2001.
  c. **Northeast Association of State Transportation Officials Annual Meeting:** The NETC Coordinator presented an exhibit of NETC research projects at the NASTO Annual Meeting held in Portland, Maine in May, 2001.
  d. **Connecticut Joint Highway Research Advisory Council Meeting:** The NETC Coordinator presented a report on the activities of the Consortium to the CT Joint Highway Research Advisory Council at its December 18, 2001 meeting.
  e. **American Association of State Highway Transportation Officials Region One Research Advisory Committee Meeting:** The NETC Coordinator made a power-point presentation entitled “The New England Transportation Consortium” at the AASHTO Region One RAC meeting held in Providence on June 26, 2001. The presentation covered the mission, funding, organization, management, project development procedures and highlights of the Consortium’s activities for calendar year 2000.
  f. **Papers Presented at Technical Conferences or Published in Technical Journals:** NETC researchers made 6 presentations at technical conferences and published 1 paper in a technical journal:


3. SPIE Symposium on Smart Systems for Bridges, Structures, and Highways, Newport Beach, CA, March 2001:
   a. “Inspection of Bridge Columns and Retaining Walls with Electromagnetic Waves,” D. Huston, University of Vermont; (NECT Project 94-2)
   b. “Wireless Inspection of Structures Aided by Robots,” D. Huston, University of Vermont; (NECT Project 94-2)

4. American Concrete Institute Fall Convention, Toronto, Ontario, Canada, October 2001: “On the Use of Combinations of Durability


4. OTHER:
- The New England Transportation Consortium was selected, along with WindSat (a Department of the Navy R&D program), and the Northern Virginia Regional Partnership (an alliance of counties and municipalities formed to foster technological development), as the subject of a study on “The Interorganizational Dynamics of Technology Partnerships”. The study was published as a doctoral dissertation, by Sujata S. Millick, and presented to the School of Policy, Planning, and Development, University of Southern California, August 2001.
C. PROGRESS OF ACTIVE PROJECTS

PROJECT NUMBER: 94-1

PROJECT TITLE: Structural Analysis of New England Subbase Materials and Structures

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): K. Wayne Lee, Milton T. Huston, Jeffrey S. Davis, and Sekhar Vajjhala, University of Rhode Island, Department of Civil Engineering

STATUS: Completed

INITIAL AGREEMENT DATE: N/A

END DATE: N/A

PROJECT OBJECTIVES: The objectives of this research were: (1) to compile a database of subbase aggregate properties by aggregate types common to New England, (2) collect data from existing analysis of natural aggregates and recycled material/aggregates blends, (3) develop recycled material blends, and (4) recommend appropriate testing for State agencies to develop optimum properties for specific sources and various combinations of blended materials projects.

The objectives were amended to modify the existing Instron testing system for the ASHTO TP46, and to characterize the subbase materials with and without reclaimed asphalt pavement (RAP).

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001:
Upon approval of the Technical Committee, one hundred (100) copies of the final research report were submitted to the NETC Coordinator.

REPORTS, PAPERS, AND PRESENTATIONS:

1. A technical paper was presented at the 1998 TRB Annual Meeting based on the findings of original scope, i.e., resilient modulus testing in accordance with the AASHTO T292-91 procedure in January 1998.

2. A technical paper with findings of the original objective, entitled “Structural Properties of New England Subbase Materials of Flexible Pavements,” was presented at the 5th International Conference on the Bearing Capacity of Roads, and Airfields on July 8, 1998.

3. Results of the resilient modulus test in accordance with the AASHTO TP-46 procedure were presented at the 11th Rhode Island Transportation and Civil Engineering Forum on 10/21/98.
4. A technical paper was presented at the 1999 World Congress for Korean Scientists and Engineers on July 7, 1999.

5. Results of this study were presented at the 12th Rhode Island Transportation Forum on October 15, 1999.

PROJECT NUMBER: 94-2

PROJECT TITLE: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dryver R. Huston, Mechanical Engineering Department, University of Vermont; Peter L. Fuhr, Electrical Engineering Department, University of Vermont; Kenneth Maser, Infrasense Inc., Arlington, MA; William Weedon, Applied Radar Analysis, Watertown, MA

STATUS: Continuing

INITIAL AGREEMENT DATE: 10/16/95

END DATE: 9/30/99

PROJECT OBJECTIVES: The overall goal of this project is to advance the state-of-the-art in ground-penetrating-radar (GPR) imaging techniques so that it will become an even more practical and precise tool for assessing the integrity of reinforced concrete bridge decks, with particular attention directed towards the specific problems of the bridges in New England. The plan is to conduct numerical, laboratory and field studies with the ultimate goal of developing a reliable and easy-to-use field technique. Phase I involves the numerical modeling of the interactions of defects in concrete bridge decks and GPR through the adaptation of available algorithms, software and dielectric parameter data. Phase II involves the laboratory verification of the numerical models through the testing of specimens with known defects. Phase III involves the development of radar waveform image processing techniques so that defect conditions can be identified readily. Phase IV involves the field-testing of the methods on selected bridge structures in New England. Phase V involves the development of the appropriate documentation so the technology developed in this project is capable of being used by the state transportation agencies. This is an interdisciplinary project that has a team of investigators from Vermont and Massachusetts: Prof. Dryver R. Huston and Prof. Peter L. Fuhr from the University of Vermont; Dr. Kenneth Maser of Infrasense, Inc.; and Dr. William Weedon of Applied Radar Analysis, Inc. The project will take three years to complete.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: A draft final project report was submitted to the Project Technical Committee for review.

REPORTS, PAPERS, AND PRESENTATIONS:


PROJECT NUMBER:  96-2

PROJECT TITLE:  Optimizing GPS Use in Transportation Projects

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):  John E. Bean,

STATUS:  Continuing

INITIAL AGREEMENT DATE:  7/1/97

END DATE:  6/30/99

PROJECT OBJECTIVES:  To identify ways to optimize the use of GPS in transportation projects.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001:
Completed draft reports of the summer 1997 individual meetings with each New England State DOT and distributed them to the DOT's for comment, correction, and additional information.

Computer programs have been developed to:  a) continuously download, translate, and archive base station data and b) transfer base station data from remote sites to a central location via network or modem.  An automated zip drive-based station archiving system was developed and working GPS base stations were established at two locations.

Met with ConnDOT administrators to review status for completion of tasks.  Continued working on incorporating GPS base at UCONN into cooperative CORS.  Continued working with NH DOT on data distribution plan.  Worked to install GPS base station at Springfield Technical Community College.  Contacted State reps to get updates on GPS usage.

REPORTS, PAPERS AND PRESENTATIONS:  None
PROJECT NUMBER: 96-3

PROJECT TITLE: Effectiveness of Fiber Reinforced Composites as Structural and Protective Coverings for Bridge Elements Exposed to Deicing-Salt Chlorides

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): P. Balaguru, Professor, Rutgers, The State University of New Jersey and Kang-Won W. Lee, Professor, The University of Rhode Island

STATUS: Completed

INITIAL AGREEMENT DATE: N/A

END DATE: N/A

PROJECT OBJECTIVES: The primary objective of the proposed research is to identify a cost-effective composite system that will provide long-term performance under freeze-thaw, wet-dry, and deicing salt environments. The primary tasks are: (i) selecting the promising candidates in terms of materials, combination of fibers and matrices, and application techniques, and (ii) evaluation of the selected materials and systems for long-term performance.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:
The final report was completed in May 2001.

REPORTS, PAPERS AND PRESENTATIONS:


PROJECT NUMBER: 97-1

PROJECT TITLE: A Portable Method to Determine Chloride Concentration on Roadway Pavements

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Norman W. Garrick and Nikolaos P. Nikolaidis, University of Connecticut

STATUS: Continuing

INITIAL AGREEMENT DATE: 9/1/98

END DATE: 9/30/01

PROJECT OBJECTIVES: The objective of this work is the development of technology to be used in conjunction with a management framework for effective deicer deployment. The goal is a system that will result in the optimum use of road deicer, thereby, reducing the cost and minimizing the undesirable water quality effects of chlorine, while, at the same time, preserving highway safety.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: Design of the second-generation prototype salinity-measuring device was initiated. The design was guided by the results of both field and laboratory testing of the first prototype. The results were quite promising but they also indicate some shortcomings with the prototype. Specifically it was felt that the original system was not sufficiently precise or responsive. The new design is expected to be much better in this regard because the overall size of the system has been significantly reduced and an improved system for melting snow has been installed.

The old system consists of two major components: the sample collection assembly, and the measurement unit. This system is designed to collect in the storage box any slush that is splashed up by the front vehicle tire. This slush is heated in the box and then flows through appropriate filters to the measurement chamber. The salinity of the water in the chamber is measured using a conductivity meter. The meter is designed to continuously measure and record the salinity of water that is pumped through the measurement chamber. The conductivity meter is connected to a laptop computer that is configured to give instantaneous readings of salinity and other pertinent measures such as the water temperature.

Figure 1: Close-up of Redesigned Prototype
The new prototype is quite similar in principle to the old; however, the retention volume
was significantly decreased from 500 ml to 66 ml. In addition, the heating system was upgraded by increasing the power and by adding a controller to regulate the temperature in the unit. A redesigned system was completed. Testing of the redesigned system was completed and a Draft Final Report was submitted to the Technical Committee for review.

**REPORTS, PRESENTATIONS, AND PAPERS:** None
PROJECT NUMBER: 97-2

PROJECT TITLE: Performance Evaluation and Economic Analysis of Combination of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast U.S.A.

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Scott A. Civjan, University of Massachusetts, Amherst

STATUS: Continuing

INITIAL AGREEMENT DATE: 8/30/98

END DATE: 8/30/02

PROJECT OBJECTIVES: To evaluate the performance of chemical and mineral durability enhancing admixtures in structural reinforced concrete mixes typical of those specified by State Highway Departments in New England. Combinations of silica fume, fly ash, ground granulated blast furnace slag, disodium salts, and chemical corrosion inhibitors are being considered. The final report will contain guidelines for the New England State Highway Departments on the specification and use of mineral and chemical admixtures in structural reinforced concrete, including both expected long-term durability enhancement and overall life cycle economic impacts.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The long term testing protocol continued for all specimens. One “non-cracked” specimen of mixes 1, 3 and 4 (control, silica fume, fly ash) and DSS specimens was initiated at the 6 month period (specimens delayed). The first 1-1/2 years of testing was completed. The evaluation of data is continuing.

Initial Findings:
- Early cracking observed in silica fume mix, however this did not occur when silica fume was used in combination with other admixtures.
- Calcium Nitrite appears to work well as a single admixture in uncracked specimens.
- Combinations of Calcium Nitrite with Slag or Fly Ash showed improvements on cracked specimens as well.
- DSS material appears to eliminate early corrosion potential, even in initially “cracked” specimens.
- To date, 32 of 56 initially non-cracked specimens have negligible macrocell corrosion potential readings (reading approximately zero), while others are well below the expected level to indicate significant corrosion. Negligible readings are present in 12 of 20 single admixture and 20 of 32 admixture combination non-cracked specimens.
REPORTS, PAPERS, AND PRESENTATIONS:


PROJECT NUMBER: NETC 99-1

PROJECT TITLE: NETC Bridge Rail Transitions - Development and Crash Testing

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Jerry Zoller, New Hampshire Department of Transportation

STATUS: Continuing

INITIAL AGREEMENT DATE: 6/5/98

END DATE: To be determined

PROJECT OBJECTIVES: (1) To design bridge rail transitions for use with the NETC 2-bar curb-mounted and 4-bar sidewalk-mounted steel bridge railings, and (2) to crash test them to meet NCHRP 350 TL-3 criteria.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The technical committee has submitted the design of the three transition sections to FHWA for comment.

REPORTS, PAPERS, AND PRESENTATIONS: None
PROJECT NUMBER: NETC 99-2

PROJECT TITLE: Evaluation of Asphaltic Expansion Joints

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Prof. Walaa S. Mogawer, P.E., UMass Dartmouth

STATUS: Continuing

INITIAL AGREEMENT DATE: 8/1/01

END DATE: 7/31/03

PROJECT OBJECTIVES:

1. To evaluate the overall costs including periodic maintenance.
2. To identify its average useful life span.
3. To identify flaws in installation and maintenance methods which could hinder maximum performance.
4. To establish recommendations and limitations regarding expansion, skew, thermal limits, etc.
5. To identify possible reasons for failure, and
6. To develop a specification and design/repair guidelines as well as methods for quality control for use by State Highway Departments.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: A kick-off meeting with the project technical committee was held on October 26, 2001. The technical committee has provided the PI with potential joints to be inspected. The consultant, Dr. Rajib Mallick, developed a draft inspection sheet. A spreadsheet of all potential bridges for inspections was prepared and emailed to the committee members for review.

REPORTS, PAPERS AND PRESENTATIONS: None
PROJECT NUMBER: 99-3

PROJECT TITLE: Guidelines for Development of Statewide Scour Monitoring Systems in New England

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(IES): Carlton.L. Ho, Assistant Professor, University of Massachusetts Amherst, Jeffrey M. Di Stasi, Graduate Research Assistant, University of Massachusetts Amherst

STATUS: Completed

INITIAL AGREEMENT DATE: N/A

END DATE: N/A

PROJECT OBJECTIVES: (1) Create a GIS for each state that catalogs the locations and attributes of scour critical bridges, precipitation gages, stream gages, and in-place scour monitors throughout New England; (2) Identify the procedures taken by states to identify scour critical bridges; (3) Identify and document all sources that provide precipitation data, stream data, storm prediction, flood forecasting, evacuation routing, etc.; (4) Develop a conceptual model of a real-time system that incorporates hazard and risk assessment for bridges jeopardized by scour.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001:
The final report was published and distributed.

REPORTS, PAPERS, AND PRESENTATIONS:


PROJECT NUMBER: 99-4

PROJECT TITLE: Quantifying Roadside Rest Area Usage

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Per Garder, University of Maine, Orono

STATUS: Continuing

INITIAL AGREEMENT DATE: 9/1/99

END DATE: 2/28/01

PROJECT OBJECTIVES: To use public input in determining the need for and spacing between roadside rest area along different types of highway.

PROGRESS/ACCOMPLISHMENTS THOUGH DECEMBER 31, 2001: The third draft of the final report was completed.

REPORTS, PAPERS, AND PRESENTATIONS: None
PROJECT NUMBER: 99-6

PROJECT TITLE: Analytical and Experimental Investigation of the Effects of Concrete Removal Operations on Adjacent Concrete That is to Remain

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Rusk Masih, University of Connecticut

STATUS: Completed

INITIAL AGREEMENT DATE: N/A

END DATE: N/A

PROJECT OBJECTIVES: To develop simplified guidelines, indicating the effect of powerful demolition equipment on the adjacent concrete that is to remain.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The Draft Final Report was approved.

REPORTS, PAPERS, AND PRESENTATIONS:


PROJECT NUMBER: NETC 00-1

PROJECT TITLE: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England - A Synthesis of Practice

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Kathleen Hancock, University of Massachusetts Amherst

STATUS: Continuing

INITIAL AGREEMENT DATE: 9/1/00

END DATE: 8/31/01

PROJECT OBJECTIVES: The primary objective of this research is to develop a synthesis of practice for ground-based imaging and data acquisition systems for roadway inventories in New England.

This project will also:
1. Provide insight into the different locational referencing schemes that are being used,
2. Determine how states in the region are coordinating those schemes, and
3. Identify how states are incorporating inventory data into geographic information systems (GIS) for transportation analysis activities.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The draft final report has been completed, submitted, and sent to the committee for review and comment.

REPORTS, PAPERS, AND PRESENTATIONS: None
PROJECT NUMBER: NETC 00-2

PROJECT TITLE: Evaluation of Permeability of Superpave Mixes

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Walaa S. Mogawer, University of Massachusetts Dartmouth; Rajib B. Mallick, Worcester Polytechnic Institute

STATUS: Continuing

INITIAL AGREEMENT DATE: 9/1/00

END DATE: 12/15/01

PROJECT OBJECTIVES:
1. Evaluate the permeability of hot mix asphalt mixes with fine and coarse gradations.
2. Evaluate the permeability of hot asphalt mixes with different nominal maximum aggregate size.
3. Evaluate the effect of different types of aggregates on permeability of HMA.
4. Prepare recommendations for design criteria of permeability values, and in-place and laboratory testing.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: A draft report has been prepared. A major accomplishment of this study was the design and fabrication of a Field Permeameter.

REPORTS, PAPERS, AND PRESENTATIONS:
PROJECT NUMBER: NETC 00-3

PROJECT TITLE: Design, Fabrication, and Preliminary Testing of a Composite Reinforced Timber Guardrail

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): W. Davids, H. Dagher, University of Maine

STATUS: New

INITIAL AGREEMENT DATE: 5/1/01

END DATE: 5/31/03

PROJECT OBJECTIVES: The primary objective of the proposed research is to develop a timber guardrail reinforced with fiber-reinforced polymers (FRP) and having the potential to meet TL-3 crash test performance criteria. This timber guardrail will take advantage of glued-laminated timber technology, allowing the use of more readily available smaller sections of dimensioned lumber. The FRP reinforcement will permit the use of lower grade lumber, making native New England species (such as red maple and Eastern hemlock) competitive with non-native timber.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001:
1. We have wrapped up the literature review, which included reviewing both reports and technical papers pertinent to the analysis and testing of timber guardrails and posts. The literature review resulted in two important conclusions: a) relatively little is known about the structural response of timber guardrails under vehicular impact; and b) the most reliable and feasible alternative for analyzing the guardrail system under vehicular impact to determine rail design values is the existing program BARRIER VII. We note that BARRIER VII is recommended for use in NCHRP Report 350, which specifies guardrail crash-test requirements.

2. BARRIER VII has been used to analyze timber guardrail systems assuming average soil-structure interaction properties reported in the literature and conventional steel W-beam posts. In addition, a series of parametric studies have been run using BARRIER VII where guardrail stiffness and strength properties were varied within the range expected for an FRP-reinforced timber guardrail. This has provided us with the design moments, shears, and axial forces that must be carried by an FRP-reinforced timber guardrail under a TL-3 crash test scenario. Perhaps more importantly, however, this has allowed us to quantify the ductility required for the guardrail. The FRP reinforcing is crucial in providing this ductility, which cannot be achieved with a guardrail made from only glulam or solid-sawn timber.
3. A nonlinear, deterministic moment-curvature analysis program has been written that allows the guardrail layup and reinforcement level to be optimized to meet the expected strength and ductility requirements.

4. Material selection has been studied in detail. At this point, it appears that red maple is the most likely candidate for FRP-reinforced guardrail construction due to its low cost and high strength. An independent study currently underway at the University of Maine AEWC has indicated that affordable, 1” thick red maple laminations can achieve mean tensile strengths of up to 9 ksi, and lower-cost laminations can easily achieve mean tensile strengths of 5-6 ksi. FRP reinforcing will likely be an E-glass epoxy plate manufactured by Gordon Composites, which has proven durable in bond studies with southern yellow pine.

3. A design cross-section approximately 10” high and 5” deep has been selected based on moment-curvature and BARRIER VII analyses. This will require a brickwork-type layup, since the red maple laminating stock is most affordable in widths of 4” – 5”.

4. Options for the splicing of rail sections are being developed. A critical issue that has been identified through the analyses performed in Task 1 is whether the required tensile strength can be developed in the rail system without the use of a continuous steel plate running along the guardrail such as that used on the Merritt Parkway. A viable alternative may be an FRP dowel or plate embedded in and bonded to spliced rail sections. We plan to study this alternative in detail. One critical issue is the embedment length of the dowel required to develop the tensile strength of the FRP dowel. Second, constructability of the spliced section is an issue, since installation and repairs will require field splicing.

REPORTS, PAPERS AND PRESENTATIONS: None
PROJECT NUMBER: 00-6

PROJECT TITLE: Effective Visualization Techniques for the Public Presentation of Transportation Projects

PRINCIPAL INVESTIGATORS: Norman W. Garrick, Peter Miniutti and Mark Westa, University of Connecticut

STATUS: New

INITIAL AGREEMENT DATE: 6/01/01

END DATE: 6/30/03

PROJECT OBJECTIVES: The objective of this work is to develop an effective approach that area DOT’s can use for presenting transportation projects to the public.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000: One field trip was made to Connecticut Department of Transportation and a mail-in survey of the six New England DOTs was conducted to develop a baseline for the state-of-the-art in New England including equipment use, personnel availability and methodology. The results of the survey are being compiled. The recommended package of presentation elements and techniques is being refined.

REPORTS, PAPERS AND PRESENTATIONS: None
PROJECT NUMBER: NETC 00-7


PRINCIPAL INVESTIGATOR(s) & UNIVERSITY(s): Dr. Emily Parkany, Assistant Professor, University of Massachusetts, Amherst

STATUS: New

INITIAL AGREEMENT DATE: 9/1/00

END DATE: 6/30/02

PROJECT OBJECTIVES: This study focuses on a comprehensive evaluation and comparison on all available sensor technologies and processing algorithms for incident detection. There is an emphasis on implemented algorithms, arterial algorithms and algorithms that utilize section data other than point data.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001:
1. All academically recognized incident detection algorithms were reviewed and compared and the algorithms used for arterials and based on probe-based and drive based data were emphasized. Previous literature reviews were also investigated, but the focus of this review is distinguished from previous reviews.
2. A new classification system for current incident detection approaches was defined and identified.
3. A review on procedures for calibration of incident detection algorithms was conducted.
4. The first draft of the final report has been finished. However, newly available findings and progress will further be incorporated into this study. Hence the report draft is being revised and improved.
5. A set of recommendations of incident detection implementation approaches based on the previous evaluations and comparisons were made.

REPORTS, PAPERS, AND PRESENTATIONS:
1. “Use of Driver-Based Data for Incident Detection,” Parkany, E. Submitted to the 7th International Conference on Applications of Advanced Technologies in Transportation Engineering (AATT) to be held in Boston in August 2002.
PROJECT NUMBER: 00-8

PROJECT TITLE: Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dana Humphrey, University of Maine, Orono

STATUS: New

INITIAL AGREEMENT DATE: 7/1/01

END DATE: 6/30/05

PROJECT OBJECTIVES: To evaluate the performance and effectiveness of several alternative cold regions pavement designs that utilize geogrids and/or drainage geocomposites as an integral member in a thin pavement section. Test sections will be constructed a part of a Federal/State, Maine Department of Transportation highway reconstruction project and evaluated for: (1) the influence of the location of a geogrid in a relatively thin pavement section on pavement performance; (2) the influence of a drainage geocomposite in a relatively thin pavement section on pavement performance; (3) the influence of a drainage geocomposite in a pavement reclamation application on pavement performance; (4) the influence of using both a geogrid and drainage geocomposite in a relatively thin pavement section on pavement performance; (5) comparing the performance of a geogrid and/or drainage geocomposite in a relatively thin pavement section to a typical standard thick pavement section.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The instrumentation for seven test sections were fabricated and installed as part of reconstruction of Route 9/126 in Monmouth-Litchfield, Maine. Installation occurred in September 2001. Instrumentation will be installed in an additional five sections in 2002.

Instrumentation installed in the 2001 construction season included 60 strain gages attached to geogrid to monitor the in-place deformation of the grid, 10 vibrating wire piezometers to measure pore water pressures in the subbase course and subgrade soils in sections with drainage geocomposite, and 7 thermocouple strings with twelve individual thermocouples in each string to monitor the depth of frost penetration. The strain gages were attached directly to the ribs of the geogrid. They were installed in pairs-one on top and one on bottom of the rib. This allows the elongation of the rib to be separated from bending. They were protected by an epoxy coating. As of December 31, 2001, 58 out of 60 strain gages are operating, which demonstrates the effectiveness of the protective system. The piezometers have a measurement range of 0 to 34 kPa (0 to 5 psi) and an accuracy of +/- 0.17 kPa (+/-0.025 psi). This allows heads as low as 1.5mm (0.06 in.) to be measured. Weekly readings were generally taken on the instrumentation.
Preparations were made to connect the instrumentation to an automatic data acquisition system. Instrumentation to be installed in the 2002 construction season was fabricated.

REPORTS, PAPERS, AND PRESENTATIONS: None
PROJECT NUMBER: NETC 01-2

PROJECT TITLE: Development of a Testing Protocol for QC/QA of Hot Mix Asphalt

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Walaa S. Mogawer, P.E., UMass Dartmouth, and Rajib Mallick, Worcester Polytechnic Institute

STATUS: New

INITIAL AGREEMENT DATE: 9/1/02

END DATE: 12/31/02

PROJECT OBJECTIVES:
1. Evaluate the sensitivity, accuracy and repeatability of the rapid triaxial testing equipment.
2. Develop criteria for using the results from these tests for identifying poor and good performing mixes during production and construction.
3. Develop quality control and quality assurance specification limits based on the results from the triaxial testing equipment.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The research team obtained a gradation from New Hampshire for a 12.5 mm mix. Samples are being prepared using aggregates from Aggregate Industries (Wrentham, MA quarry). The rapid triaxial equipment is being upgraded to include an environmental chamber and a higher load capacity module.

REPORTS, PAPERS, AND PRESENTATIONS: None
PROJECT NUMBER: 01-3

PROJECT TITLE: Design of Superpave HMA for Low Volume Roads

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Prof. Walaa S. Mogawer, P.E., UMass Dartmouth, and Prof. Rajib Mallick, Worcester Polytechnic Institute

STATUS: New

INITIAL AGREEMENT DATE: 9/1/01

END DATE: 8/31/03

PROJECT OBJECTIVES:
1. Develop compaction and volumetric (mix design) criteria for designing asphalt mixes for low volume roads.
2. Evaluate the performance of mixes designed according to these criteria.
3. Provide recommendations for proper implementation of the new mix design system by the state DOTs.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001:
Mix design was conducted with three different 9.5 mm NMAS aggregate gradations - two fine gradations from ME and one from NH. Aggregate from Aggregate Industries (Wrentham, MA) quarry was used.

A review of the mix design data and a comparison of the data with the data provided by NH and ME DOT showed that the aggregate that is being used is very much different from the ones used by NH and ME DOT. Also, in the laboratory the aggregates were separated into different fractions and reblended (as opposed to getting different percentages from different stockpiles).

Therefore, a decision was taken to get aggregates from different stockpiles from NH and ME (different means the ones from which the gradations have been suggested for this study), and blend them in the same proportion as done by the NH and ME DOT in their mix designs. Both ME and NH DOT have agreed to provide aggregates.

These aggregates will be procured shortly. It is expected that the time required for mix design will be very short, since mix design information (using the very same aggregates) is already available from NH and ME DOT. However, some time will be required to determine the asphalt contents for designing the mixes at different number of gyrations.

REPORTS, PAPERS, AND PRESENTATIONS: None
PROJECT NUMBER: 01-6

PROJECT TITLE: Field Evaluation of a New Compaction Monitoring Device

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Heather J. Miller, PI, University of Massachusetts Dartmouth, and Rajib Mallick, Co-PI, Worcester Polytechnic Institute

STATUS: New

INITIAL AGREEMENT DATE: 8/1/01

END DATE: 7/31/03

PROJECT OBJECTIVES: The primary objective of this study is to verify the effectiveness of the “Soil Compaction Meter” as a tool for determining optimum compaction for highway construction applications. The scope of this project will initially involve performing a literature review of previous research performed on the Compaction Meter in order to identify the operational parameters, current capabilities and limitations of the device. Subsequently, testing will be performed to evaluate the effective uses of the device in a variety of applications and for a variety of materials. Based upon statistical analysis of the data obtained, conclusions and recommendations for use of the device in highway applications will be provided.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2001: The start date for this project was August 1, 2001. The initial work on the project involved contacting key personnel at Foster Miller and MBW. A great deal of published and unpublished data regarding the Compaction Meter (SCM) was obtained. The theory of operation and the results of previous research performed on the SCM were reviewed. To become more familiar with the device, the PI and undergraduate research assistants visited some construction sites where they had the opportunity to try out the device during compaction operations.

Five different soil and aggregate samples were obtained and transported to the labs at UMD and WPI for testing (as outlined under Task 3A). At UMD, sieve analyses and Proctor compaction testing on some of the samples has been completed. At WPI, the largescale test frame has been prepared, and testing will begin on the gravel borrow and on the common borrow in early January.

REPORTS, PAPERS, AND PRESENTATIONS: None
### Table 1: Financial Status of Projects Active During 2001
(As of 11/31/01)

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>APPROVED BUDGET</th>
<th>INVOICED TO DATE</th>
<th>PROJECT BALANCE</th>
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| 94-1: Structural Analysis of New England Subbase Materials and Structures  
*P.I.: K.W. Lee*  
*University of Rhode Island* | 111,497.00 | 110,057.38 | 1,439,62 |
| 94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging  
*P.I.: D. Huston*  
*University of Vermont* | 224,902.00 | 224,901.80 | 0.20 |
| 94-4: Durability of Concrete Crack Repair Systems  
*P.I.: G. Tsiatas*  
*University of Rhode Island* | 84,850.00 | 72,036.04 | 12,813.96 |
| Project Terminated  
04/09/01 |
| 95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes  
*P.I. K.W. Lee*  
*University of Rhode Island* | 132,313.00 | 120,812.20 | 11,500.80 |
| Project Closed  
04/11/01 |
| 95-5: Buried Joints in Short Span Bridges  
*P.I.s: G. Tsiatas and K.W. Lee*  
*University of Rhode Island* | 64,910.00 | 61,705.61 | 3,204.39 |
| Project Terminated  
04/09/01 |
### Table 1: Financial Status of Projects Active During 2001
(As of 11/31/01)
(Cont’d)

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</table>
| 96-1: Superpave Implementation  
P.I.: J. Stephens  
University of Connecticut | 74,978.00 | 60,139.25 | 14,838.75 |
| 96-2: Optimizing GPS Use in Transportation Projects  
P.I.: C. R. Ferguson, J. Bean  
University of Connecticut | 120,000.00 | 26,670.01 | 93,329.99 |
| 96-3: Effectiveness of Fiber Reinforced Composites as Structural and Protective Coverings for Bridge Elements  
P.Is.: P.N. Balaguru, Rutgers University; K.W. Lee, University of Rhode Island | 135,000.00 | 122,534.87 | 12,465.13 |
| 97-1: A Portable Method to Determine Chloride Concentration on Roadway Pavements-Phase I  
P.Is.: N.W. Garrick, N.P. Nikolaidis; University of Connecticut | 97,502.00 | 96,669.50 | 832.50  
Final Invoice Approved 10/15/01 |
| 97-1: A Portable Method to Determine Chloride Concentration on Roadway Pavements-Phase II  
P.Is.: N.W. Garrick, N.P. Nikolaidis; University of Connecticut | 107,162.00 | 76,997.21 | 30,164.79 |
Table 1: Financial Status of Projects Active During 2001  
(As of 11/31/01)  
(Cont’d)

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| 97-2: Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast USA  
P.I.: S. Civjan  
University of Massachusetts | 118,473.00 | 98,546.54 | 19,926.46 |
| 97-3: Determining Properties, Standards and Performance of Wood Waste Compost as an Erosion Control Mulch and as a Filter Berm  
P.I.s: K.R. Demars, R.P. Long  
University of Connecticut | 54,649.00 | 43,853.94 | 10,795.06  
Project Closed  
04/11/01 |
| 97-4: Early Distress of Open-Graded Friction Course (OGFC)  
P.I.s: J. Stephens, J. Mahoney, C. Dougan, University of Connecticut | 79,865.00 | 57,495.71 | 22,369.29 |
| 99-3: Development of Priority Based Statewide Scour Monitoring Systems in New England  
P.I.: C. Ho  
University of Massachusetts, Amherst | 79,999.00 | 78,523.32 | 1,475.68 |
| 99-4: Quantifying Roadside Rest Area Usage  
P.I.s: P. Garder  
University of Maine | 44,857.00 | 30,864.70 | 13,992.30 |
Table 1: Financial Status of Projects Active During 2001  
(As of 11/31/01)  
(Cont’d)

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  P.I.: S. Civjan  
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<td>00-1: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England: A Synthesis of Practice</td>
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<td>P.Is.: W.S. Mogawer</td>
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<td>00-3: Design, Fabrication, and Preliminary Testing of a Composite, Reinforced, Timber Guard Rail</td>
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<td>006: Effective Visualization Techniques for The Public Presentation of Transportation Projects</td>
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Table 1: Financial Status of Projects Active During 2001  
(As of 11/31/01)  
(Cont’d)

<table>
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<th>PROJECT</th>
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<th>PROJECT BALANCE</th>
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| 00-7: A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn’t  
  P.I.: E. Parkany  
  Villanova University                                                    | 45,384.00       | 42,692.91        | 2,691.09        |
| 00-8: Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region  
  P.I.: D. Humphrey  
  University of Maine                                                       | 150,000.00      | 49,173.97        | 100,826.03      |
| 01-2: Development of a Testing Protocol for Quality Control/Quality Assurance of Hot Mix Asphalt  
  P.I.: W.S. Mogawer  
  University of Massachusetts, Dartmouth                                     | 80,000.00       | 2,528.05         | 77,471.95       |
| 01-3: Design of Superpave Hot Mix Asphalt For Low Volume Roads  
  P.I.: W.S. Mogawer  
  University of Massachusetts, Dartmouth                                     | 99,755.00       | 0.00             | 99,755.00       |
Table 1: Financial Status of Projects Active During 2001
(As of 11/31/01)
(Cont’d)

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*P.I.: H. Miller
University of Massachusetts, Dartmouth*

Notes: 1. Although final reports have been published for Projects 96-1 and 97-4 final invoices are outstanding.
2. “Invoiced to Date” excludes retainage.
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<td>(Supplemental Funding)</td>
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<td>Structures</td>
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96-3: Effectiveness of Fiber Reinforced Composites as Protective Coverings for Bridge Elements, etc.  

T2 (per 12/2/97 Adv. Committee Mtg.) for 1998 = $10,000  

Coord./Admin. of NETC: Calendar Year 1998; Bdgt = $73,021  

Member Allocations 1998 = 6 X $75,000  

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<th>BALANCE</th>
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| 97-1: A Portable Method for Determining Chloride Concentration on Roadway Pavements | 96,669.5  
|                                      | 107,162.0  
|                                      | 00  
|                                      | Phase 1/FINAL Phase 2  
| 97-2: Performance Evaluation & Economic Analysis of Durability Enhancing Admixtures, etc. | 118,472.0  
|                                      | 00  
| 97-3: Determining Properties, Standards & Performance of Wood Waste Compost, etc. | 43,853.9  
|                                      | FINAL  
| 97-4: Alloc. to ConnDOT for Constr. Costs of Test Site (Approved 1/21/99 Ballot) | 11,000.0  
|                                      | 0  
| 97-5: Travel Tech. Comm. (Aug. 98 tel. poll) for 1998 = $5,000 | 0.00  
|                                      | 288,847.4  
| Member Allocations 1999 = 6 X $75,000 | 450,000.00  
|                                      | 738,847.4  
| Coord./Admin. of NETC: Calendar Year 1999: | 738,847.4  
|                                      | 8  
|                                      | Administration  
|                                      | = $77,666  
|                                      | Technology Transfer & Technical Committee  
|                                      | Travel  
|                                      | = $20,400  
|                                      | Total  
|                                      | = $98,066  
| "99" Project Series:               |              |            |         |         |         |
| 99-1: Bridge Rail Transitions | 240,000.0  
|                                      | 0  
| 99-2: Evaluation of Asphaltic Expansion Joints | 62,236.0  
|                                      | 0  
| 99-3: Bridge Scour Monitoring Systems | 79,999.0  
|                                      | 0  
| 99-4: Quantifying Roadside Rest Area Usage | 44,857.0  
|                                      | 0  
| 99-6: The Effects of Concrete Removal Operations on Adjacent That Is to Remain | 99,689.0  
|                                      | 0  
| Member Allocations 2000 = 6 X $100,000 | 600,000.00  
|                                      | 732,965.2  
| Coord./Admin. of NETC: Calendar Year 2000: | 732,965.2  
|                                      | 8  
|                                      | Administration  
|                                      | = $85,788  
|                                      | Technology Transfer & Technical Committee  
|                                      | Travel  
|                                      | = $16,800  
|                                      | Total  
|                                      | = $102,588
TABLE 2: NETC Fund Balance (Cont'd)
(As Of December 31, 2001)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>ALLOCATION</th>
<th>ENCUMB/ CUM.</th>
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<tbody>
<tr>
<td>00-7: A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn't</td>
<td>45,384.0</td>
<td>139,576.9</td>
</tr>
<tr>
<td>00-8: Performance and Effectiveness of A Thin Pavement Section Using Geogrids and Drainage Geocomposites in A Cold Region</td>
<td>150,000.0</td>
<td>10,423.09</td>
</tr>
</tbody>
</table>

Member Allocations 2001 = 6 X $100,000
600,000.00 | 589,576.9 |

Coord./Admin. of NETC: Calendar Year 2001:
104,385.0 | FINAL 485,191.5 |

- Administration
  - $89,448 |
- Technology Transfer & Technical Committee
  - Travel
    - $16,800 |
- Total
  - $106,248 |

"01" Project Series:

01-1: Advanced Composite Materials for New England's Transportation Infrastructure | 50,000.0 | 435,191.5 |

01-2: Development of A Testing Protocol for Quality Control/Quality Assurance of Hot Mix Asphalt | 80,000.0 | 355,191.5 |

01-3: Design of Superpave HMA for Low Volume Roads | 126,657.0 | 228,534.5 |

Note: Additional funding ($26,902) approved 11/19/02

01-5: Procedures for the Evaluation of Liquid-Applied Membrane | 75,000.0 | 153,534.5 |

01-6: Field Evaluation of A New Compaction Device | 50,000.0 | 103,534.5 |

Member Allocations 2002 = 6 X $100,000
600,000.00 | 703,534.5 |

NY DOT Allocation = $52,500
52,500.00 | 756,034.5 |

Coord./Admin. Of NETC: Calendar Year 2002
123,967.0 | 632,067.5 |
| Note: Member allocations are obligated between October 1 and December 31 |  |  |  |
E. NETC REPORTS, PAPERS, AND PRESENTATIONS

E1. POLICIES AND PROCEDURES:

E2. ANNUAL REPORTS:
"Annual Report For Calendar Year 1996," January 1997, NETCR4
"Annual Report For Calendar Year 1998," January 1999, NETCR10
"Annual Report For Calendar Year 1999," January 2000, NETCR21
"Annual Report For Calendar Year 2000," August 2001, NETCR27

E3. REPORTS, PAPERS, AND PRESENTATIONS 1988-1994:


"Regional Rail Planning In New England," Martland, C.P. Little, and Alvaro, A.E., MIT, August 1993. (Accepted for publication 1994)


E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001:

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>N/A</td>
<td>Construction Costs Of New England Bridges</td>
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<tr>
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<td>Reports:</td>
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<tr>
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<td>Papers and Presentations:</td>
</tr>
<tr>
<td>N/A</td>
<td>Tire Chips As Lightweight Backfill For Retaining Walls, Phase II: Full-Scale Testing:</td>
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<tr>
<td></td>
<td>Reports:</td>
</tr>
<tr>
<td></td>
<td>Papers and Presentations:</td>
</tr>
<tr>
<td></td>
<td>&quot;Civil Engineering Uses for Tire Chips,&quot; Humphrey D.N. A six-hour short course presented to the Nebraska Department of Environmental Quality, the Maine Dept. of Transportation, the Texas Engineering Extension Service, the Manitoba Tire Stewardship Board, the Alberta Tire Recycling Management Board, and the Arkansas Department of Pollution Control and Ecology.</td>
</tr>
<tr>
<td>Project No</td>
<td>Title</td>
</tr>
<tr>
<td>------------</td>
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<tr>
<td>N/A</td>
<td>Tire Chips As Lightweight Backfill For Retaining Walls, Phase II: Full-Scale Testing:</td>
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<tr>
<td></td>
<td>Papers and Presentations (cont’d):</td>
</tr>
<tr>
<td></td>
<td>&quot;Tire Chips: A New Road Building Geomaterial,&quot; Humphrey, D. N. Presented at the Conference on Waste and Recycled Materials in the Transportation Infrastructure, held in conjunction with the 75th Annual Meeting of the Transportation Research Board, January 7, 1996.</td>
</tr>
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<td></td>
<td>&quot;Use of Tire Chips in Civil Engineering.&quot; Presented at the 76th Annual Meeting of the Rubber Association of Canada, March 7, 1996.</td>
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<td>Project No.</td>
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<tr>
<td>N/A</td>
<td>Tire Chips As Lightweight Backfill For Retaining Walls, Phase II:</td>
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<td>Full-Scale Testing:</td>
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<td></td>
<td>Papers and Presentations (cont’d):</td>
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<tr>
<td></td>
<td>&quot;Tire Shreds as Retaining Wall Backfill, Active Conditions,&quot; Tweedie,</td>
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<tr>
<td></td>
<td>J.J., Humphrey, D.N., and Sandford, T.C, Journal of Geotechnical and</td>
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<tr>
<td></td>
<td>Geoenvironmental Engineering, ASCE, Vol. 124, No. 11, Nov., pp. 1061-</td>
</tr>
<tr>
<td></td>
<td>1070, 1998.</td>
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<tr>
<td></td>
<td>&quot;Highway Applications of Tire Shreds,&quot; Humphrey, D. A 7-hour short</td>
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<td></td>
<td>course presented in each of the six New England States, 1998.</td>
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<tr>
<td></td>
<td>&quot;Highway Applications of Tire Shreds,&quot; Humphrey, D. A 7-hour short</td>
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<tr>
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<td>course presented in each to the RI DOT, April 1999.</td>
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<td>N/A</td>
<td>New England Vehicle Classification And Truck Weight Program, Phase I</td>
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<td>Reports:</td>
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<tr>
<td></td>
<td>&quot;New England Vehicle Classification and Truck Weight Program, Technical</td>
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<td></td>
<td>&quot;New England Vehicle Classification and Truck Weight Program, Technical</td>
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<td></td>
<td>Report No. 2: Toward the Development of a Truck Weight Program for New</td>
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<td></td>
<td>England,&quot; Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and</td>
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<td>Shuldiner, P., April 1996.</td>
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<td></td>
<td>&quot;New England Vehicle Classification and Truck Weight Program, Technical</td>
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<tr>
<td></td>
<td>&quot;New England Vehicle Classification and Truck Weight Program, Phase I,&quot;</td>
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<tr>
<td></td>
<td>Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T. and Shuldiner,</td>
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<td></td>
<td>P., April 1996, NETCR2.</td>
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<td>Papers and Presentations:</td>
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<td></td>
<td>&quot;An Analysis of Vehicle Class and Truck Weight Patterns in New</td>
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<td></td>
<td>Traffic Data Acquisition Conference, Rocky Hill, Connecticut, September</td>
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### E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

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<th>Project No.</th>
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<td>N/A</td>
<td>New England Vehicle Classification And Truck Weight Program, Phase I</td>
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**Papers and Presentations (cont’d):**


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<tr>
<th>N/A</th>
<th>Bridge Rail Crash Test, Phase II: Sidewalk-Mounted Rail</th>
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**Reports:**


**Papers and Presentations:** None

<table>
<thead>
<tr>
<th>94-1</th>
<th>Structural Analysis Of New England Subbase Materials And Structures</th>
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</table>

**Reports:**


**Papers and Presentations:**


### E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Title</th>
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<tbody>
<tr>
<td><strong>94-1</strong></td>
<td>Structural Analysis Of New England Subbase Materials And Structures</td>
</tr>
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#### Papers and Presentations (cont’d):


| 94-2        | Nondestructive Testing Of Reinforced Concrete Bridges Using Radar Imaging Techniques |

#### Reports: None

#### Papers and Presentations


<table>
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<tr>
<th>Project No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>94-2</td>
<td>Nondestructive Testing Of Reinforced Concrete Bridges Using Radar</td>
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Papers and Presentations (cont’d):


### E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

<table>
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<tr>
<th>Project No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>94-3</td>
<td>Nondestructive Testing Of Reinforced Concrete Bridges Using Radar</td>
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**Papers and Presentations (cont’d):**


**94-3**

**Procedures For The Evaluation Of Sheet Membrane Waterproofing**

**Reports:**


**Papers and Presentations** None

**94-4**

**Durability Of Concrete Crack Repair Systems**

**Reports:** None
<table>
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<tr>
<th>Project No.</th>
<th>Title</th>
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<tr>
<td>94-4</td>
<td>Durability Of Concrete Crack Repair Systems</td>
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<tr>
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<td>Papers and Presentations:</td>
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<td></td>
<td>&quot;Durability of Concrete Crack Repair, Projects,&quot; Robinson, J.</td>
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<tr>
<td></td>
<td>Presented at the University of Rhode Island Graduate Seminar Series,</td>
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<tr>
<td></td>
<td>&quot;Durability of Concrete Crack Repair System,&quot; Tsiatas, G. and</td>
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<tr>
<td></td>
<td>Robinson, J. Presentation to representatives of the Chemical</td>
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<td></td>
<td>Grouting Division of Kajima Corporation (Japan), University of Rhode</td>
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<td></td>
<td>Island, College of Engineering, October 26, 1999.</td>
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<tr>
<td>95-1</td>
<td>Use Of Tire Chip/Soil Mixtures To Limit Frost Heave And Pavement</td>
</tr>
<tr>
<td></td>
<td>Damage Of Paved Roads</td>
</tr>
<tr>
<td></td>
<td>Reports:</td>
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<tr>
<td></td>
<td>“Use of Tire Chip/Soil Mixtures to Limit Frost Heave and Pavement</td>
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<tr>
<td></td>
<td>Damage of Paved Roads,” Brian, K.L., and Humphrey, D. N., June 2000,</td>
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<td>NETCR12.</td>
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<td>Papers and Presentations:</td>
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<tr>
<td></td>
<td>&quot;Laboratory and Field Measurement of the Thermal Conductivity of</td>
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<tr>
<td></td>
<td>Tire Chips for Use as Subgrade Insulation,&quot; Humphrey, D., Chen, L.H.</td>
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<tr>
<td></td>
<td>and Eaton, R. A paper submitted to the Transportation Research</td>
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<td></td>
<td>Board for presentation at the session on &quot;Properties of</td>
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<td></td>
<td>Unconventional Aggregates&quot; at the Annual Meeting of the Transportation</td>
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<tr>
<td></td>
<td>&quot;Highway Applications of Tire Shreds,&quot; Humphrey, D. A 7-hour short</td>
</tr>
<tr>
<td></td>
<td>course presented in each of the six New England States, 1998.</td>
</tr>
<tr>
<td></td>
<td>&quot;Highway Applications of Tire Shreds,&quot; Humphrey, D. A 7-hour short</td>
</tr>
<tr>
<td></td>
<td>course presented to the RI DOT, April 1999.</td>
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<td></td>
<td>&quot;Field Trial of Tire Shreds as Insulation for Paved Roads,&quot; Humphrey,</td>
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<td></td>
<td>Chen, L.H., Lawrence, B. A paper presented at the 10th International</td>
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<td></td>
<td>Conference on Cold Regions Engineering: Putting Research into Practice, held in Hanover, NH, August 16-19, 1999.</td>
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<tr>
<td>95-2</td>
<td>Suitability Of Non-Hydric Soils For Wetland Mitigation</td>
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<td>Reports:</td>
</tr>
<tr>
<td></td>
<td>&quot;Suitability of Non-Hydric Soils for Wetland Mitigation,&quot;</td>
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<td></td>
<td>Papers and Presentations:  None</td>
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### E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

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<th>Project No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>95-3</td>
<td>Implementation And Evaluation Of Traffic Marking Recesses For Application of Thermo-Plastic Markings On Modified Open Graded Mixes</td>
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**Reports:**

**Papers and Presentations:**


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<tr>
<th>95-5</th>
<th>Buried Joints In Short Span Bridges</th>
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**Papers and Presentations:**

<table>
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<tr>
<th>95-6</th>
<th>Guidelines For Ride Quality Acceptance Of Pavements</th>
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**Papers and Presentations:** None

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<tr>
<th>96-1</th>
<th>Implementation of Superpave</th>
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**Papers and Presentations:** None
E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

<table>
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<th>Project No.</th>
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<tr>
<td>96.2</td>
<td>Optimizing GPS Use in Transportation Projects</td>
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<td>Papers and Presentations: None</td>
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<tr>
<td>96-3</td>
<td>Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides</td>
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<td>Reports:</td>
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<tr>
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<td>&quot;Effectiveness of High Strength Composites as Structural and Protective Coatings for Structural Elements,” Balaguru, P., and Lee, K.W., May 2001, NETCR28</td>
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<td></td>
<td>Papers and Presentations:</td>
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<td>&quot;Recent Advances in Fiber Composites,&quot; Seminar Series, University Cataleuna, Spain, June 28, 1999.</td>
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E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

Project No.  Title
96-3  Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides

Papers and Presentations (cont’d):
"Recent Advances in High Strength Composites and Applications for Repair and Rehabilitation,” 6th International Conference on Structural Failure, Durability, and Retrofitting, Singapore, September 15, 2000.


97-1  A Portable Method To Determine Chloride Concentration On Roadway Pavements

Reports: None.

Papers and Presentations: None.

"Performance Evaluation of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete,” Sund, D., Report in Partial Fulfillment of Master of Science in Civil Engineering Degree, Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, September, 1999.

E4. REPORTS, PAPERS AND PRESENTATIONS 1995-2001 (cont’d):

<table>
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<tr>
<th>Project No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>97-2</td>
<td>Performance Evaluation And Economic Analysis Of Combinations Of Durability Enhancing Admixtures (Mineral And Chemical) In Structural Concrete For The Northeast U.S.A</td>
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</table>

Reports (cont’d):

Papers and Presentations:

97-3 Determining Properties, Standards And Performance Of Wood Material As An Erosion Control Mulch And As A Filter Berm

Reports:

97-4 Early Distress Of Open-Graded Friction Course (OGFC)

Reports:

Papers and Presentations: None

99-1 Bridge Rail Transitions

Reports: None

Papers and Presentations: None

99-2 Evaluation of Asphalitic Expansion Joints

Reports: None

Papers and Presentations: None
### E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

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<th>Project Number</th>
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<tr>
<td>99-4</td>
<td>Quantifying Roadside Rest Area Usage</td>
<td>Reports: None</td>
<td>Papers and Presentations: None</td>
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<td>00-1</td>
<td>Ground-Based Imaging And Data Acquisition Systems For Roadway Inventories In New England - A Synthesis Of Practice</td>
<td>Reports: None</td>
<td>Papers and Presentations: None</td>
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<tr>
<td>Project Number</td>
<td>Title</td>
<td>Reports</td>
<td>Papers and Presentations</td>
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<tr>
<td>00-3</td>
<td>Design, Fabrication and Preliminary Testing of a Composite Reinforced Timber Guardrail</td>
<td>None</td>
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<td>00-6</td>
<td>Effective Visualization Techniques for the Public Presentation of Transportation</td>
<td>None</td>
<td>None</td>
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<tr>
<td>00-7</td>
<td>A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn’t</td>
<td>None</td>
<td>“Use of Driver-Based Data for Incident Detection,” Parkany, Emily, Submitted to the 7th International Conference on Applications of Advanced Technologies in Transportation Engineering (AATT) to be held in Boston in August 2002.</td>
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<tr>
<td>00-8</td>
<td>Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region</td>
<td>None</td>
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<td>01-2</td>
<td>Development of a Testing Protocol for QC/QA of Hot Mix Asphalt</td>
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<td>Project Number</td>
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<td>01-3</td>
<td>Design of Superpave HMA for Low Volume Roads</td>
<td>None</td>
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<td>01-6</td>
<td>Field Evaluation of a New Compaction Monitoring Device</td>
<td>None</td>
<td>None</td>
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