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For Calendar Year 2000**

NEW ENGLAND TRANSPORTATION CONSORTIUM

NETCR27

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NEW ENGLAND TRANSPORTATION CONSORTIUM

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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.

The Consortium operates through a) a committee structure consisting of: a Policy Committee, an Advisory Committee and Project Technical Committees and b) a Coordinator and Lead State.

B. 2000 ACCOMPLISHMENTS

1. **Funding Approved For New Research In Eight High Priority Areas:** The NETC Policy Committee, upon recommendation of the Advisory Committee, approved funding for new research in the following areas:
 - Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England
 - Permeability of Superpave Mixes
 - Composite Reinforced Timber Guardrail
 - Portable Falling Weight Deflectometer
 - Modified Eccentric Loading Guardrail Terminal
 - Visualization Techniques for Public Presentations of Transportation Projects
 - Incident Detection Algorithms
 - Thin Pavements Using Geogrids and Drainage Composites in a Cold Region
2. **Consortium Publishes First Newsletter:** 'Research News' the Consortium's biannual newsletter was published for the first time and distributed to three hundred transportation professionals and researchers at New England's transportation agencies and state universities. This edition of the newsletter contains information on the Consortium's organization, active research projects and available publications.
3. **Federal Highway Administration Awards Consortium Grant To Develop Electronic Newsletter:** The Consortium won a competitive technology marketing grant, from the Federal Highway Administration for its proposal to develop a web-based electronic version of the Consortium's newsletter 'Research News'. It will be completed in 2001.

4. **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:
- Use of Wood Waste Materials for Erosion Control
 - Use of Tire Chip/Soil Mixtures To Limit Frost Heave and Pavement Damage of Paved Roads
 - Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Friction Course
5. **Twelve Student Research Positions Funded At Participating Universities:** During 2000, NETC-funded research projects supported 12 student research positions at participating universities, 7 of which were graduate students and 5 of which were undergraduate students.
6. **Technology Transfer:**
- **Requests for Research Reports:** Fifteen requests for final reports of NETC funded research projects were processed. Requests were received from: the Arizona, Maryland and Ohio Departments of Transportation; the Massachusetts Turnpike Authority; the Coalition of New England Governors; the Ministry of Transport, Government of Quebec; the Town of Auburn, MA; consultants in New Jersey, New Hampshire and Massachusetts; a magazine publisher in Ohio; a member of private industry in Massachusetts; FHWA-RI.
 - **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 Department of Transportation.
 - b. **New England Materials and Research Engineers 11th Annual Meeting:**
 - 1) "Advanced Composites for the Protection of Transportation Infrastructure" (a report on preliminary findings from NETC Project 96-3), Dr. Perumalsamy Balaguru, Rutgers University
 - 2) "Marketing the New England Transportation Consortium Research Program," Gerald McCarthy, NETC Coordinator
 - c. **American Association of State Highway Transportation Officials Annual Meeting:** The NETC Coordinator presented an exhibit of NETC research projects at the AASHTO Annual Meeting held in Indianapolis, Indiana in December, 2000.
 - d. **Northeast Association of State Transportation Officials Annual Meeting:** The NETC Coordinator presented an exhibit of NETC research projects held at the NASTO Annual Meeting in Mashantucket, Connecticut in April, 2000.

e. 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 21, 2000 meeting.

- **Papers Presented at Technical Conferences or Published in Technical Journals:** NETC researchers made nine presentations at technical conferences and published three papers in technical journals.

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: Continuing

INITIAL AGREEMENT DATE: 9/10/95

END DATE: 3/31/99

PROJECT OBJECTIVES: The objectives of this research are: (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 AASHTO TP46, and to characterize the subbase materials with and without reclaimed asphalt pavement (RAP).

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

URI research team revised the draft final report in accordance with comments of the technical committee, and sent it to the technical committee for the approval of printing on September 14, 2000.

REPORTS, PAPERS AND PRESENTATIONS: None

PROJECT NUMBER: 94-2

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

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dryver R. Huston, University of Vermont

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, 2000:

The major accomplishments during this period were the development of a handheld radar system that can be used to inspect bridge columns and retaining walls. This unit was tested in the lab and used to test two bridges in Vermont. The handheld unit is fairly crude, but is possibly the first of its type. In addition, pavement studies were conducted on an I-89 overpass in New Hampshire. A draft final report was submitted to the Technical Advisory Committee for review. Suggestions for revision have been incorporated into a revised final report.

REPORTS, PAPERS AND PRESENTATIONS:

1. "Wireless Electromagnetic Interrogation of Structures," Huston, D., Pelczarski, N., Fuhr, P., Arms, S. and Esser, B. Accepted pending revision, Smart Materials and Structures, March 2000.

2. "GIMA Ground Penetrating Radar System For Infrastructure Health Monitoring," Huston, D.R., Hu, J.Q., Maser, K., Weedon, W., and Adam, C. *Journal of Applied Geophysics* 43(2000), pp. 39-146.
3. "Damage Detection in Roadways with Ground Penetrating Radar," Huston, D.R., Pelczarski N., Esser, B. and Maser, K. *GPR 2000, Eighth International Conference on Ground Penetrating Radar*, Gold Coast, Australia, May 2000.
4. "Damage Assessment in Roadways with Ground Penetrating Radar," Huston, D., Pelczarski, N., Esser, B., Maser, K., and Weedon, W. *SPIE Conference on Nondestructive Evaluation and Health Monitoring of Aging Infrastructure*, 3995A-55, Newport Beach CA, March 2000.
5. "Good Impedance Match Antenna (GIMA) Design and Its Applications for Ground Penetrating Radar In Concrete Structures NDE Applications," Hu, J. M.S. Thesis, Department of Mechanical Engineering, University of Vermont, March 2000.
6. "Bridge Deck Evaluation with Ground Penetrating Radar," Huston, D., Hu, J., Pelczarski, N., and Esser, B. *Proc. Second International Conference on Structural Health Monitoring*, Stanford University, September 1999.
7. "Ground Penetrating Radar for Concrete Bridge Health Monitoring Applications," Huston, D, Hu, J., Maser, K., Weedon K., and Adam, C. *SPIE 3587-23 Proc. SPIE NDE Techniques for Aging Infrastructure and Manufacturing*, Newport Beach, CA, March 1999.
8. "GIMA Antenna Design for Ground Penetrating Radar in Concrete NDE Applications," Hu, J.Q., Huston, D., and Fuhr, P. *SPIE 3670-63, SPIE Conf. on Sensory Phenomena and Measurement Instrumentation for Smart Structures and Materials*, Newport Beach, CA, March 1999.
9. "Bridge Deck Evaluation with Ground Penetrating Radar," Huston, D., Maser, K., Hu, J.Q., Weedon, W., and Adam, C. *Proc. GPR '98 7th International Conference on Ground-Penetrating Radar*, The University of Kansas, Lawrence, KS, May 27-30, 1998.
10. "Bridge Deck Evaluation with Ground Penetrating Radar," Huston, D., Maser, K., Weedon, W., Fuhr, P. and Adam C. *Structural Health Monitoring*, F. Chang, ed., Technomic Publishing, pp. 91-103 *Proc. International Workshop on Structural Health Monitoring*, Stanford, CA, Sept. 1997.
11. "Ground Penetrating Radar for Nondestructive Evaluation of Concrete Bridge Decks," Adam, C., M.S. Thesis, Department of Mechanical Engineering, University of Vermont, September 1997.

PROJECT NUMBER: 94-4

PROJECT TITLE: Durability of Concrete Crack Repair Systems

PRINCIPAL INVESTIGATORS: G. Tsiatas, University of Rhode Island, Department of Civil & Environmental Engineering

STATUS: Terminated

INITIAL AGREEMENT DATE: 9/1/97

END DATE: 12/31/99

REPORTS, PAPERS, AND PRESENTATIONS:

1. "Durability of Concrete Crack Repair Projects," Robinson, J. Presented at the University of Rhode Island Graduate Seminar Series, Kingston, RI, November 19, 1997.
2. "Durability of Concrete Crack Repair Systems," Tsiatas, G. and Robinson, J. A presentation to representatives of the Chemical Grouting Division of Kajima Corporation (Japan), University of Rhode Island, College of Engineering, October 26, 1999.

NOTE: This project was terminated without a final report.

PROJECT NUMBER: 95-3

PROJECT TITLE: Implementation and Evaluation of Traffic Marking Recesses For Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): K. Wayne Lee, Stephen A. Cardi, II and Sean Corrigan, The University of Rhode Island and Cardi Corporation

STATUS: Completed

INITIAL AGREEMENT DATE: N/A

END DATE: N/A

PROJECT OBJECTIVES: If thermoplastic pavement striping were applied to a constructed recess in the pavement surface, snowplow blades would pass over without damaging either the marking or the pavement. This study will determine the best means of creating traffic marking recesses and the cost effectiveness of this method. To accomplish this task the URI research team will work with a contractor on an existing construction project to carry out a trial field installation of the traffic marking recesses. Construction specifications will be developed for this method by the URI research team with the assistance of the contractor.

After construction, the durability and retroreflectivity of the recessed markings will be monitored three times each year for two years. The monitoring and evaluation period will take place once prior to the winter maintenance season, once during the winter months and once after the winter maintenance season. The durability of the recessed markings will be evaluated by a subjective rating method, and the retroreflectivity will be measured by a retroreflectometer. The URI research team will also produce a narrative videotape of late night wet-weather condition review of the test sections. The final report will be submitted within 3 weeks of the final evaluation and will include pictures of each evaluated section, the late night wet-weather video, as well as comparisons of the recessed and non-recessed areas durability and retroreflectivity.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

Upon the technical committee's approval, one hundred (100) copies of final research report and twelve (12) copies of narrative videotapes were submitted to NETC Coordinator on 11/7/00.

REPORTS, PAPERS AND PRESENTATIONS:

1. "Implementation and Evaluation of Traffic Marking Recesses For Application of Thermoplastic Pavement Markings on Modified Open Graded Friction Course," Lee, K. Wayne, Cardi II, Stephen A., Corrigan, Sean, July 2000, NETCR23.

PROJECT NUMBER: 95-5

PROJECT TITLE: Buried Joints in Short Span Bridges

PRINCIPAL INVESTIGATORS: G. Tsiatas, University of Rhode Island, Department of Civil & Environmental Engineering

STATUS: Terminated

INITIAL AGREEMENT DATE: 8/1/95

END DATE: Completion of work

REPORTS, PAPERS AND PRESENTATIONS:

1. "State of the Art Study of Bridge Joint Systems in New England," Tsiatas, G. and Chandrasekaran, S. A paper submitted for presentation at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

NOTE: This project was terminated without a final report.

PROJECT NUMBER: 96-2

PROJECT TITLE: Optimizing GPS Use in Transportation Projects

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): C. Roger Ferguson, University of Connecticut and John E. Bean, Central Connecticut State University

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, 2000:

Met with representatives of the three primary GPS equipment vendors to discuss available equipment, equipment features, and equipment prices. Information obtained from these meetings will be used in matrix compilation for Task 2. Arranged for each of the vendors to exhibit their wares and answer questions about GS equipment and technology at a combined meeting of all of the New England GPS users that will be coordinated as part of this project.

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 which was missed in the meeting minutes.

Completed the draft composite report of the summer 1997 New England State DOT meetings.

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.

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: Continuing

INITIAL AGREEMENT DATE: 8/31/97

END DATE: 12/31/00

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:

Results obtained during this investigation were used for part of the following publications and presentations.

REPORTS, PAPERS AND PRESENTATIONS:

Publications:

1. "Comparison of Inorganic and Organic Matrices for Strengthening of Reinforced Concrete Beams," Kurtz, S., and Balaguru, P., Journal of Structural Engineering ASCE, V 127, January 2001, pp.35-42.
2. Garon, R., and Balaguru, P., "Durability of Carbon Composites made with Inorganic Matrix," SAMPE, November 2000, pp.34-43.
3. Garon, R., and Balaguru, P., "Durability of High Strength Composite Repairs under Scaling Conditions," Proceedings of Third International Conference on Concrete Under Severe Conditions, Vancouver, Canada, June 2001 (in print).

Presentations:

1. "Inorganic Matrices for Composites," NSF Workshop on Composites, Hanover, NH, March 15, 1998.
2. "Behavior of Geopolymer Reinforced with Various Types of Fabrics," SAMPE 1998, Anaheim, CA, May 1998.
3. "Use of Ferrocement Theory for Analysis of High Strength Composites," Ferrocement VI, Ann Arbor, MI, June 1998.
4. "Advances in Composites," National University of Singapore, July 19, 1998.
5. "Advanced High Strength Fiber Composites," U.S.- Germany Workshop, Mainz, Germany, May 16-19, 1999.
6. "Recent Advances in High Performance Concrete," URTRC Forum, URI, Kingston, RI, October 15, 1999.
7. "Inorganic Matrix - High Strength Fiber Composites," University of Missouri, Rolla, July 27, 2000.
8. "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.
9. "Durability of High Strength Composite Repairs under Scaling Conditions," CONSEC '01, June, 2001.

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, 2000:

In September we began work on designing our second-generation prototype salinity-measuring device. In this effort we were 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 we felt that the original system was not sufficiently precise or responsive. The new design is expected to be much better in this regard because we have drastically reduced the size of the system and have installed a superior system for melting snow.

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 we selected 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.

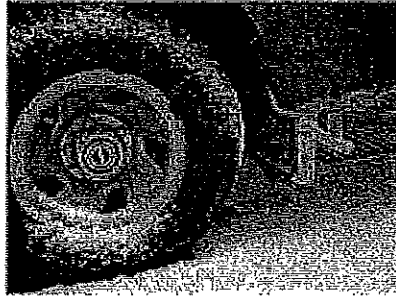


Figure 1: Close-up of Redesigned Prototype

The new prototype is quiet 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. The redesigned system was completed in December and testing will commence in January 2001.

REPORTS, PRESENTATIONS, AND PAPERS: None

PROJECT NUMBER: NETC 97-2

PROJECT TITLE: "Performance Evaluation and Economic Analysis of Combinations 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: 8/31/01

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, 2000:

- 1) Final mix designs for specimens completed, forwarded to, and approved by the NETC Technical Committee for review.
- 2) Materials received, specimens constructed, and specimens prepared and wired for long term testing.
- 3) Temperature/humidity enclosures constructed and tested.
- 4) Test setup completed, data collection methods finalized.
- 5) Long term testing protocol initiated for all specimens.
- 6) Internal NETC Interim Report distributed (no comments received/finalized).
- 7) One "non-cracked" specimen of mixes 1, 3 and 4 (control, silica fume, fly ash) were re-cast due to early cracking.
- 8) DSS materials delayed 6 months due to fabrication/delivery problems (specimens delayed)
- 9) Continual evaluation of data.

Initial Findings

- 1) Early cracking observed in silica fume mix; however this did not occur when silica fume was used in combination with other admixtures.
- 2) All initially cracked specimens that included fly ash, as an individual admixture or in combination, exhibited reduced macrocell corrosion potential readings through testing to date, as compared to other specimens.
- 3) DSS material appears to eliminate early corrosion potential, even in initially "cracked"

specimens.

- 4) To date, 38 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 25 of 32 admixture combination non-cracked specimens.

REPORTS, PRESENTATIONS, AND PAPERS:

1. "Performance Evaluation of Combinations of Durability Enhancing Admixtures in Concrete – Review and Experimental Program," Lovett, D., Report in Partial Fulfillment of Master of Science in Civil Engineering Degree, Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, February, 2001.
2. "On the Use of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete," LaFave, J. M., Lovett, D., and Civjan, S. A., ACI Fall Convention, Toronto, Ontario, Canada, October 15-21 2000.
3. "Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast U.S.A.," LaFave, J. M., Civjan, S. A., Lovett, D., and Sund, D. J., Internal Interim Report prepared for the New England Transportation Consortium, July 2000.
4. "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.

PROJECT NUMBER: NETC 97-3

PROJECT TITLE: Determining Properties, Standards and Performance of Wood Waste Material as an Erosion Control Mulch and as a Filter Berm

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Richard P. Long and Kenneth R. Demars, University of Connecticut, Storrs

STATUS: Completed

INITIAL AGREEMENT DATE: N/A

END DATE: N/A

PROJECT OBJECTIVES: The objective of this study is to perform laboratory and simulated field testing of the physical and chemical properties and behavior of wood waste compost for use in erosion control on construction projects. The two applications of interest are the use of compost as an erosion control mulch on slopes and as an erosion control filter berm. Particular goals include: 1) the development of criteria to predict the field behavior of wood waste material for various uses, and 2) recommendation of procurement specifications and associated testing protocols.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

Laboratory testing and analysis was completed. A Preliminary Draft Report was submitted to the technical committee for review and comment.

Summary

The filtration properties of wood waste mulch were evaluated for use in an erosion control berm application. Four wood waste materials were subjected to laboratory testing to determine their hydraulic properties in the unaltered state and the modified state. The modifications consisted of adding small particles to the grain-size distribution of the wood waste. The filtration behavior of these materials was evaluated for the 1-D condition in a permeameter and for the 2-D flow condition in a sloping plexiglas box. The 2-D tests simulated field use of wood waste as an erosion control berm. The tests used a series of glass beads of known size and an erodible soil from the field test site, consisting of a silty fine sand, which was mixed with water and passed through the test apparatus. The suspended solids content of the effluent was used as a measure of filter effectiveness. The results of this study and the earlier phases were used to prepare model procurement specifications for wood waste material as erosion control mulch and as erosion control filter berm, which are appended to the report.

Conclusions

- 1.) This study and the earlier field test phase have shown that the wood waste erosion control filter berm can be effective at controlling erosion. The paper mill wood waste used in this research was more effective than geosynthetic silt fence or hay bales.

- 2.) The well-established principles of aggregate filtration apply to the filtration behavior of wood waste materials in the filter berm application, although selecting sizes of wood waste materials is not as straight forward. A typical wood waste material requires at least 20-30% by dry weight passing the No. 20 sieve to be an effective filter berm which will retain fine sand to silt sized particles.
- 3.) For coarse wood waste materials having between 10 and 30% passing the No. 30 sieve, the filtration properties and performance of a filter berm can be improved by adding to the upstream face a thin layer of soil containing particle sizes 80% of which are greater than the No. 30 sieve.
- 4.) The moisture content of the wood waste material is not critical, but it is best placed when it is slightly damp to help compact the material.
- 5.) Paper mill wood waste performed best as a filter berm because it contained a high portion of fine particles and had a lower permeability than other materials tested.

REPORTS, PAPERS AND PRESENTATIONS:

1. "Use of Wood Waste Materials For Erosion Control," Demars, Kenneth R., Long, Richard P., Ives, Jonathan R., April 2000, NETCR20.

PROJECT NUMBER: 99-1

PROJECT TITLE: 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: To produce a crash tested bridge rail transition design for use with the NETC 2-bar curb-mounted and 4-bar sidewalk-mounted steel bridge railing acceptable to FHWA.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

The technical committee effort is a continuation of the NETC 2-bar and 4-bar bridge rail design and crash testing project of 1988-1999 which ended with NETC issuing reports R10 and R14.

The committee has developed a transition design for both the 2-bar and 4-bar NETC bridge rail systems. In addition, a third transition design has been developed utilizing a concrete end block.

These transition designs have been submitted for review and concurrence by FHWA prior to entering the crash testing phase of the project.

REPORTS, PAPERS, AND PRESENTATIONS: None

PROJECT NUMBER: NETC 99-3

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

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

STATUS: Continuing

INITIAL AGREEMENT DATE: 9/1/99

END DATE: 3/31/01

PROJECT OBJECTIVES: 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 each New England state; identify the procedures taken by states to identify scour critical bridges; identify and document all sources that provide precipitation data, stream data, storm prediction, flood forecasting, evacuation routing, etc.; 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, 2000:

Examined state-of-the-art scour applications such as ScourWatch and contemporary scour applications such as HEC-18, Comparative Scour Analysis, and Rapid Estimation Method

- 1) Reviewed types of scour monitoring techniques/instrumentation
- 2) Performed and documented extensive Internet search for websites containing sources of real-time hydrological and meteorological data, including automated stream and rain gage networks, weather forecasting offices, and radar.
- 3) Developed a comprehensive GIS for each New England state to evaluate bridges susceptible to scour that includes coverages of automated gage networks (precipitation and stream), bridges, and dams.
- 4) Reviewed and proposed methods of predicting discharge at ungaged bridge sites for different recurrence intervals.
- 5) Proposed conceptual, flexible, priority-based model by which scour can be evaluated in real-time through adoption and modification of existing scour analyses and utilization of Internet resources; the strength of the model is its incorporation of multiple algorithms for analytical purposes.
- 6) Outlined the framework of a warning system in which statistical analysis of historical gage data from active real-time stream gages is used to monitor bridge scour in real-time to assist emergency personnel prepare and respond to a storm event; this includes the generation of "scour tables" for each bridge at various flow recurrence intervals.

REPORTS, PAPERS, AND PRESENTATIONS:

1. Real-Time Bridge Scour Assessment and Warning, Di Stasi, J.M. and Ho, C.L.
Proceedings of International Symposium: Technical Committee No. 33 on Scour of Foundations. Melbourne, Australia, pp. 337-352.

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: The primary objective of the research is to use public input in determining the need for and spacing between roadside rest areas along different types of highways, i.e., interstates and other state highways. The focus of this research is planned to be on interstate facilities. Another objective is to clarify which services are essential, highly appreciated, somewhat appreciated, and of little value, and how these needs vary over the day. A service may be essential even if there is a fairly low demand for it. For example, even if only one in ten-thousand motorists passing a rest area is so sleepy that he/she needs to stop, providing a safe place to take a nap for that person may save his/her life as well as other people's lives. On the other hand, a rest area may attract hundreds or thousands of motorists every day because it is a convenient place to buy drinks and snacks. But if the rest area were to be closed, existing fast-food restaurants and convenience stores at next exit may easily be able to provide the same services, at least if information about this is provided. In other words, it is not only quantifying rest-area usage that should form the basis of whether to keep a rest area or not. Conversely, usage volumes—which are correlated with sales revenue—are what counts when negotiating leasing fees. Thus, the opinion of the public regarding the importance of services provided at rest areas should form the basis of such an analysis.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

A draft final report was delivered in December 2000. Feedback to that draft was received February 14, 2001. Corrections will be made before the end of March 2001, and a new draft will be submitted, hopefully before that.

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, Avery Point

STATUS: Continuing

INITIAL AGREEMENT DATE: 8/23/99

END DATE: 02/28/02

PROJECT OBJECTIVES: To achieve simplified guideline, indicating the effect of the powerful demolition equipment on the concrete to stay.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

1. The equipment and strain gages were ordered and procured for the project before the start of the project. The equipment and strain gages cost was born by UCONN School of engineering, rather than the project.
2. All strain gages were installed on the deck, the abutments and the pier of the bridge to measure the effect of the heavy demolition equipment on the remaining parts of the bridge. The monitoring of the effect of demolition through the strain gages was accomplished successfully and the readings were recorded by the monitoring equipment and the lap top computer all were purchased by the University of Connecticut School of Engineering. The reading results were graphed for each strain gage. It was found that the effect of the 4 inch diameter Hoe-Ram on the remaining structure is limited to local areas not exceeding 2 feet from the center of the load application. The effect on other areas was insignificant, when the deck is 7 ½ inch thick, however if the thickness is decreased, then those stresses introduced by the demolition become quite significant. Such observations were backed by the theoretical analysis, using ANSYS finite elements program. Both static analysis and dynamic analysis were consistent with the strain gages. The dynamic analysis gave a dynamic load factor of 1.8 since structural damping was not included in the analysis for extra safety.
3. All the samples of the concrete taken from the project were tested and found that the effect of the demolition equipment mentioned above was not spreading to a significant distance.
4. Most of the static analysis is finished.
5. Most of the dynamic analysis is finished.
6. The mathematical modeling of the structure to check the effect of the wave equation is done and most of the analysis related to the wave equation effect on the remaining parts of the structure is finished.

REPORTS, PAPERS AND PRESENTATIONS:

1. Enhancing The Students' Learning Process Through Interaction Project Between Academia And Industry. Presented and published in the Abstract of ASEE 2000 at the University of Massachusetts Lowell, April 2000.
2. The Effect Of The Powerful Demolishing Equipment On The Remaining Parts Of The Concrete Bridge. Presented and published in the proceedings of the Second International Conference on Computational Methods for Smart Structures and Material. Madrid, June 2000.
3. Effect Of Demolition On Remaining Part Of Concrete Bridge, Numerical Analysis Vs. Experimental Results. Presented and published in the proceedings of Internationales Kolloquium uber die Anwedungen der Informatik in Architectur and Bauwesen, Germany, June 2000.
4. The Effect Of Bridge Rehabilitation On The Remaining Structural Parts. Presented and published in the ASCE conference in Stanford University, August 2000.

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 at Amherst

STATUS: New

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:

- provide insight into the different locational referencing schemes that are being used,
- determine how states in the region are coordinating those schemes,
- and identify how states are incorporating inventory data into geographic information systems (GIS) for transportation analysis activities.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

The signed contract was received in November so only one month of activity occurred during 2000.

1. A meeting was held between the committee chair and PI to discuss the scope and proposed approach.
2. Two surveys, one for personnel responsible for collecting videolog information and one for personnel responsible for GIS activities, were completed and submitted to the committee chair for comment.
3. A cover letter for the surveys was drafted.

REPORTS, PAPERS AND PRESENTATIONS: None

PROJECT NUMBER:

00-2

PROJECT TITLE:

Evaluation of Permeability of Superpave Mixes

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

STATUS: New

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 mix 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 permeability testing.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2000:

1. A kick-off meeting was conducted on September 27, 2000 – all technical committee members were invited.
2. The compaction and evaluation of mixes from Connecticut, New Hampshire, and Massachusetts is in progress.
3. The design and fabrication of a field permeameter will be complete by the first week of April 2001.

REPORTS, PAPERS AND PRESENTATIONS: None

D. FINANCIAL STATUS

Active Projects

Table 1: Financial Status of Projects Active During 2000
(As of 12/31/00)

| PROJECT | APPROVED BUDGET | INVOICED TO DATE | PROJECT BALANCE |
|---|--------------------|---------------------|------------------------------------|
| 94-1: Structural Analysis of New England Subbase Materials and Structures <i>P.I.: K. Wayne Lee</i> <i>University of Rhode Island</i> | 111,497.00 | 110,057.38 | 1,439.62 |
| 94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging <i>P.I.: Dryver Huston</i> <i>University of Vermont</i> | 224,902.00 | 224,901.80 | 0.20 |
| 94-4: Durability of Concrete Crack Repair Systems <i>P.I.: George Tsiatas</i> <i>University of Rhode Island</i> | 84,850.00 | 72,036.04 | 8,276.96 Project Terminated |
| 95-1: Use of Tire Chips/Soil Mixtures to Limit Frost Heave and Pavement Damage of Paved Roads <i>P.I.: Dana Humphrey</i> <i>University of Maine, Orono</i> | 75,000.00 | 75,000.00 | 0.00 Project Closed: 9/21/00 |
| 95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes <i>P.I.: K. Wayne Lee</i> <i>University of Rhode Island</i> | 132,313.00 | 103,234.06 | 29,079.94 |
| 95-5: Buried Joints in Short Span Bridges <i>P.I.s: George Tsiatas and K. Wayne Lee</i> <i>University of Rhode Island</i> | 64,910.00 | 61,705.61 | 3,204.39 Project Terminated |
| 96-1: Superpave Implementation <i>P.I.: Jack Stephens</i> <i>University of Connecticut</i> | 74,978.00 | 12,942.16 | 62,035.84 |

Table 1: Financial Status of Projects Active During 2000 (As of 12/31/00) Continued

| PROJECT | APPROVED BUDGET | INVOICED TO DATE | PROJECT BALANCE |
|--|--------------------|---------------------|--------------------|
| 96-2: Optimizing GPS Use in Transportation Projects <i>P.I.: C. Roger Ferguson, John Bean University of Connecticut</i> | 120,000.00 | 26,670.01 | 93,329.99 |
| 96-3: Effectiveness of Fiber Reinforced Composites as Structural and Protective Coverings for Bridge Elements <i>P.I.s: Perumalsamy N. Balaguru, Rutgers University; K. Wayne Lee, University of Rhode Island</i> | 135,000.00 | 122,534.87 | 12,465.13 |
| 97-1: A Portable Method to Determine Chloride Concentration on Roadway Pavements-Phase I <i>P.I.s: Norman W. Garrick, Nikolais P. Nikolaidis; University of Connecticut</i> | 97,502.00 | 29,213.21 | 68,288.79 |
| 97-1: A Portable Method to Determine Chloride Concentration on Roadway Pavements-Phase II <i>P.I.s: Norman W. Garrick, Nikolais P. Nikolaidis; University of Connecticut</i> | 107,162.00 | 0.00 | 107,162.00 |
| 97-2: Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast USA <i>P.I.: S. Civjan University of Massachusetts</i> | 118,473.00 | 72,631.68 | 45,841.32 |
| 97-3: Determining Properties, Standards and Performance of Wood Waste Compost as an Erosion Control Mulch and as a Filter Berm <i>P.I.s: Kenneth R. Demars, Richard P. Long University of Connecticut</i> | 54,649.00 | 27,779.64 | 26,869.36 |

Table 1: Financial Status of Projects Active During 2000 (As of 12/31/00) Continued

| PROJECT | APPROVED BUDGET | INVOICED TO DATE | PROJECT BALANCE |
|---|--------------------|---------------------|--------------------|
| 97-4: Early Distress of Open-Graded Friction Course (OGFC) <i>P.I.s: Jack Stephens, James Mahoney, Charles Dogan University of Connecticut</i> | 79,865.00 | 57,495.71 | 22,369.29 |
| 99-3: Development of Priority Based Statewide Scour Monitoring Systems in New England <i>P.I.: C. Ho University of Massachusetts, Amherst</i> | 79,999.00 | 60,967.72 | 19,031.28 |
| 99-4: Quantifying Roadside Rest Area Usage <i>P.I.: Per Garder University of Maine</i> | 44,857.00 | 16,838.13 | 28,018.87 |
| 99-6: Analytical and Experimental Investigation of the Effects of Concrete Removal Operations on Analytical Concrete That is to Stay <i>P.I.: Rusk Masih University of Connecticut</i> | 99,689.00 | 40,647.02 | 59,041.98 |
| 00-1: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England: A Synthesis of Practice <i>P.I.: K.L. Hancock University of Massachusetts, Amherst</i> | 40,818.00 | 5,958.32 | 34,232.48 |
| 00-2: Evaluation of Permeability of Superpave Mixes <i>P.I.: W.S. Mogawer University of Massachusetts, Dartmouth</i> | 100,002.00 | 0.00 | 100,002.00 |

Note: Although final reports have been published for Projects 96-1 and 97-4 final invoices are outstanding.

Table 2: NETC Fund Balance

(As Of December 31, 2000)

| ITEM | ALLOCATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
|--|------------|--------------------|---------|-----------------|
| Unexpended Balance of NETC funds from AASHTO as of 6/5/95 (Per AASHTO memo 12/4/95) | | | | 132,777.07 |
| Member Allocations 1994 = 6 X \$75,000 | 450,000 | | | 582,777.07 |
| Coord./Admin. of NETC: Calendar Year 1995 Bdgt. = \$73042 | | 58,508.02 | FINAL | 524,269.05 |
| Continued Projects: | | | | |
| - Construction Costs of New England Bridges-Phase II | | 39,500.00 | FINAL | 484,769.05 |
| - Tire Chips as Lightweight Backfill-Phase II: Full-Scale Testing (Supplemental Funding) | | 16,000.00 | | 468,769.05 |
| - Bridge Rail Crash Test - Phase II: Sidewalk-Mounted Rail | | 134,127.00 | FINAL | 334,642.05 |
| - New England Vehicle Classification and Truck Weight Program | | 6,752.57 | FINAL | 327,889.48 |
| Member Allocations 1995 = 7 X \$75,000 | 525,000 | | | 852,889.48 |
| "95" Project Series: | | | | |
| 95-1: Use of Tire Chips/Soil Mixtures to Limit Pavement Damage of Paved Roads | | 75,000.00 | FINAL | 777,889.48 |
| 95-2: Suitability of Non-Hydric Soils for Wetland Mitigation | | 39,867.70 | FINAL | 738,021.78 |
| 95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes | | 120,812.12 | FINAL | 617,209.66 |
| 95-5: Buried Joints in Short Span Bridges | | 64,910.00 | | 552,299.66 |
| 95-6: Guidelines for Ride Quality Acceptance of Pavements | | 106,124.00 | FINAL | 446,175.66 |
| "94" Project Series: | | | | |
| 94-1: Structural Analysis of New England Subbase Materials and Structures | | 111,497.00 | | 334,678.66 |
| 94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques | | 224,902.00 | | 109,776.66 |
| Member Allocations 1996 = 6 X \$75,000 | 450,000 | | | 559,776.66 |
| Coord./Admin. of NETC: Calendar Year 1996; Bdgt. = \$75,000 | | 69,123.85 | FINAL | 490,652.81 |
| Member Allocations 1997 = 6 X \$75,000 | 450,000 | | | 940,652.81 |
| Coord./Admin. of NETC: Calendar Year 1997; Bdgt. = \$82,494 | | 77,244.35 | FINAL | 863,408.46 |
| "94" Project Series: | | | | |
| 94-3: Procedures for The Evaluation of Sheet Membrane Waterproofing | | 67,000.00 | FINAL | 796,408.46 |
| 94-4: Durability of Concrete Crack Repair Systems | | 84,850.00 | | 711,558.46 |
| "96" Project Series: | | | | |
| 96-1: SUPERPAVE Implementation | | 74,978.00 | | 636,580.46 |
| 96-2: Optimizing GPS Use in Transportation Projects | | 120,000.00 | | 516,580.46 |
| 96-3: Effectiveness of Fiber Reinforced Composites as Protective Coverings for Bridge Elements, etc. | | 135,000.00 | | 381,580.46 |
| T2 (per 12/2/97 Adv. Committee Mtg.) for 1998 = \$10,000 | | 9,551.06 | FINAL | 372,029.40 |
| Coord./Admin. of NETC: Calendar Year 1998; Bdgt = \$73,021 | | 70,871.59 | FINAL | 301,157.81 |
| Member Allocations 1998 = 6 X \$75,000 | 450,000 | | | 751,157.81 |
| "97" Project Series: | | | | |
| 97-1: A Portable Method for Determining Chloride Concentration on Roadway Pavements | | 204,664.00 | | 546,493.81 |
| 97-2: Performance Evaluation & Economic Analysis of Durability Enhancing Admixtures, etc. | | 118,473.00 | | 428,020.81 |
| 97-3: Determining Properties, Standards & Performance of Wood Waste Compost, etc. | | 54,649.00 | | 373,371.81 |
| Alloc. to ConnDOT for Constr. Costs of Test Site (Approved 1/21/99 Ballot) | | 11,000.00 | | 362,371.81 |

Table 2: NETC Fund Balance (Cont'd)

(As Of December 31, 2000)

| ITEM | ALLOCATION | ENCUMB/ EXPEND. | INVOICE | CUM. BALANCE |
|---|------------|--------------------|---------|-----------------|
| 97-4: Early Distress of Open-Graded Friction Course | | 79,865.00 | | 282,506.81 |
| Travel Tech. Comm. (Aug. 98 tel. poll) for 1998 = \$5,000 | | 0.00 | | 282,506.81 |
| Member Allocations 1999 = 6 X \$75,000 | 450,000 | | | 732,506.81 |
| Coord./Admin. of NETC: Calendar Year 1999: | | | | 732,506.81 |
| - Administration = \$77,666 | | | | |
| - Technology Transfer & Technical Committee | | | | |
| Travel = \$20,400 | | | | |
| - Total = \$98,066 | | 79,101.20 | FINAL | 653,405.61 |
| "99" Project Series: | | | | |
| 99-1: Bridge Rail Transitions | | 240,000.00 | | 413,405.61 |
| 99-2: Evaluation of Asphaltic Expansion Joints | | 60,000.00 | | 353,405.61 |
| 99-3: Bridge Scour Monitoring Systems | | 79,999.00 | | 273,406.61 |
| 99-4: Quantifying Roadside Rest Area Usage | | 44,857.00 | | 228,549.61 |
| 99-6: The Effects of Concrete Removal Operations on Adjacent | | | | |
| That Is to Remain. | | 99,689.00 | | 128,860.61 |
| Member Allocations 2000 = 6 X \$100,000 | 600,000 | | | 728,860.61 |
| Coord./Admin. of NETC: Calendar Year 2000: | | 91,899.37 | FINAL | 636,961.24 |
| - Administration = \$ 85,788 | | | | |
| - Technology Transfer & Technical Committee | | | | |
| Travel = \$ 16,800 | | | | |
| - Total = \$102,588 | | | | |
| "00" Project Series: | | | | 636,961.24 |
| 00-1: Ground-Based Imaging and Data Acquisition Systems for | | 40,818.00 | | 596,143.24 |
| Roadway Inventories in New England - A Synthesis of | | | | |
| Practice | | | | |
| 00-2: Evaluation of Permeability of Superpave Mixes | | 100,002.00 | | 496,141.24 |
| 00-3: Composite Reinforced Timber Guard Rail - Phase I: Design, | | 83,469.00 | | 412,672.24 |
| Fabrication and Testing | | | | |
| 00-4: Falling Weight Deflectometer Study | | 100,000.00 | | 312,672.24 |
| 00-5: Guard Rail Testing - Modified eccentric Loading Terminal at | | 56,887.00 | | 255,785.24 |
| NCHRP 350 TL2 | | | | |
| 00-6: Implementation of Visualization Technologies to Create | | 74,991.00 | | 180,794.24 |
| Simplified Presentations Within Highway agencies to be Used | | | | |
| at Public Hearings | | | | |
| 00-7: A Complete Review of Incident Detection Algorithms and | | 45,384.00 | | 135,410.24 |
| Their Deployment: What Works and What Doesn't | | | | |
| 00-8: Performance and Effectiveness of A Thin Pavement Section | | 150,000.00 | | -14,589.76 |
| Using Geogrids and Drainage geocomposites in A Cold | | | | |
| Region | | | | |
| Member Allocations 2001 = 6 X \$100,000 | 600,000 | | | 585,410.24 |
| Coord./Admin. of NETC: Calendar Year 2001: | | 106,248.00 | | 479,162.24 |
| - Administration = \$89,448 | | | | |
| - Technology Transfer & Technical Committee | | | | |
| Travel = \$16,800 | | | | |
| - Total = \$106,248 | | | | |
| "01" Project Series Estimated Cost | | 377,018.00 | | 102,144.24 |
| | | | | |
| Note: Member allocations are obligated between October 1 and December 31 of the previous year | | | | |

E. NETC REPORTS, PAPERS AND PRESENTATIONS

E1. Policies And Procedures:

Project

Number Title

N/A "Policies and Procedures, New England Transportation Consortium," July 1995.

E2. Annual Reports:

Project

Number Title

N/A "Annual Report For Calendar Year 1995," March 1996, NETCR3
"Annual Report For Calendar Year 1996," January 1997, NETCR4
"Annual Report For Calendar Year 1997," January 1998, NETCR9
"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:

Project

Number Title

N/A "Agreement to Implement a Common Set of Procedures for Issuing Permits for Nondivisible Oversize and Overweight Trucks Engaged in Interstate Travel," The New England Transportation Consortium, October 1988.

"The New England Transportation Consortium, Round One Activities," Humphrey, T.F., and Maser, K.R., MIT, December 1988.

"The Development of a Common Regional System for Issuing Permits for Oversize and Overweight Trucks Engaged in Interstate Travel," Humphrey, T.F., May 1986.

"New Technology for Bridge Deck Assessment - Phase I Final Report," Vols. I and II, Maser, Kenneth R., MIT Center for Transportation Studies, October 1989.

"Bridge Rail Design and Crash Worthiness - Final Report," Elgaaly, M., Dagher, H., and Kulendran, S., University of Maine, May 1989.

"New England Transportation Consortium, Operational Procedures," Humphrey, T.F., November 1991.

"Handbook for Use by the Trucking Industry to Implement The NETC Common Truck Permit Procedures for Certain Nondivisible Oversize/Overweight Vehicles Traveling on State Highways," MIT Center for Transportation Studies, January 1989.

Wetlands: Problem & Issues," Shuldiner, P.W., University of Massachussetts, August 1990.

E3. Reports, Papers, And Presentations 1988-1994 (Cont'd):

**Project
Number**
N/A

Title

"Development of a Uniform Truck Management System, Vols. I and II, Lee, K.W., and McEwen, E.E., University of Rhode Island. July 1990.

"New Technology for Bridge Deck Assessment - Phase II Final Report," MIT, May 1990.

"A Study of STAA Truck Safety In New England - Phases I & II," MIT, November 1991.

"Rail Service In New England," Martland, C.P. Little, and Alvaro, A.E., MIT Center for Transportation Studies, April 1992.

"CMA Degradation and Trace Metals in Roadside Soil," Ostendorf, D.W., Palaia, T.A., and Zutell, C.A., University of Massachusetts, March 1993.

"Tire Chips as Lightweight Backfill for Retaining Walls - Phase I," Humphrey, D., Sandford, T.C., Cribbs, M.M., Gharegrat, H.G., and Manion, W.P., University of Maine, August 1992.

"Cooperative Regional Transportation Research Programs Underway in New England," Humphrey, T.F., and Sussman, J.M., International Congress on Technology and Technology Exchange, June 1989.

"Uniformity Efforts in Oversize/Overweight Permits," Humphrey, T.F., NCHRP Synthesis, No. 143, Transportation Research Board, 1988.

"Implementation of a Uniform Truck Permit System by the New England Transportation Consortium," Humphrey, T.F., AASHTO 1987 Annual Meeting Proceedings, pp. 84-90, 1987.

"Advantages of Oversize/Overweight Truck Permit Uniformity, AASHTO 1990 Annual Meeting Proceedings, pp. 83-85, 1990.

"Crash Worthiness of Bridge Rails," Dagher, H., Elgaaly, M., and Kulendran, S., Proceedings, Fourth Rail Bridge Centenary Conference, Heriot-Watt University, Edinburgh, Scotland, August 1990.

"Principles of Radar and Thermography for Bridge Deck Assessment," Maser, R., and Roddis, W.M.K., ASCE Journal of Transportation Engineering, Vol. 116, No. 5, Sept./Oct. 1990.

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

E3. Reports, Papers, And Presentations 1988-1994 (Cont'd):

Project

Number **Title**

N/A

"CMA Degradation in Roadside Soil: Acetate Microcosms," Ostendorf, D.W., Pollock, S.J., De Cheke, M.E., and Palaia, T.A., Transportation Research Record, No. 1366, pp. 41-43, 1992.

"Aerobic Degradation of CMA in Roadside Soils: Field Simulations from Soil Microcosms," Ostendorf, D.W., Pollock, S.J., De Cheke, M.E., and Palaia, T.A., Journal of Environmental Quality, Vol. 22, pp. 229-304, 1993.

"Shear Strength and Compressibility of Tire Chips for Use as Retaining Wall Backfill," Humphrey, D.N., Sandford, T.C., Cribbs, M.M., and Manion, W.P., Transportation Research Record No. 1422, pp. 29-35, Transportation Research Board, National Research Council Washington, D.C., 1993.

"Tire Chips as Lightweight Subgrade Fill and Retaining Wall Backfill," Humphrey, D.N., and Sandford, T.C., Proceedings of the Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities, pp. 5-87 to 5-99, Federal Highway Administration, Washington, D.C., 1993.

E4. NETC Reports, Papers And Presentations 1995-2000:

Project

Number

N/A

Title

Construction Costs Of New England Bridges

Reports:

"Construction Costs of New England Bridges," Final Report, Alexander, J.A., Dagher, H. and James, S., November 1996, NETCR1.

Papers and Presentations:

"Construction Costs of New England Bridges," Alexander, J., Dagher, H. and James, S. Presented at the Annual Maine Transportation Conference, December 7, 1995.

N/A

Tire Chips As Lightweight Backfill For Retaining Walls, Phase II: Full-Scale Testing:

Reports:

"Tire Chips As Lightweight Backfill For Retaining Walls - Phase II," Tweedie, Jeffrey J., Humphrey, Dana N., and Sandford, Thomas C., March 11, 1998, NETCR8.

Papers and Presentations:

"Tire Shreds as Lightweight Retaining Wall Backfill-Active Conditions," Humphrey, D. Submitted for publication in the ASCE Journal of Geotechnical and Geoenvironmental Engineering.

"Civil Engineering Uses for Tire Chips," 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.

"Tire Chips as Lightweight Subgrade and Retaining Wall Backfill," by Humphrey, D.N. and Sandford, T.C. Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities, FHWA, Denver, Colorado, October 19-22, 1993.

E4. NETC Reports, Papers, and Presentations 1995-2000 (Cont'd):

Project

Number Title

N/A Tire Chips As Lightweight Backfill For Retaining Walls, Phase II: Full-Scale Testing (cont'd):

Papers and Presentations (cont'd):

"Use of Tire Chips as Subgrade Insulation and as Lightweight Fill for Highway Construction," Humphrey, D. N. Presented at the 18th Annual Meeting of the Asphalt Recycling and Reclaiming Association, Pompano Beach, Florida, February 23-26, 1994.

"Use of Tire Chips in Highway Construction," Humphrey, D. N. Presented to the New England Environmental Expo, Boston, Massachusetts, May 9, 1995.

"Use of Tire Chips in Highway Construction," Humphrey, D. N. Presented to the AASHTO Region 1 RAC Meeting, Portland, Maine, May 23, 1995.

"Tire Chips for Highway Construction," Humphrey, D. N. Presented to the Northeast Recycling Council in Sturbridge, Massachusetts on December 8, 1995.

"Tire Chips: A New Road Building Geomaterial," 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.

"Use of Tire Chips in Civil Engineering." Presented at the 76th Annual Meeting of the Rubber Association of Canada, March 7, 1996.

"Civil Engineering Uses for Scrap Tires," Humphrey, D. Presented at Scrap Tire '96 held in Chicago, Illinois on August 16, 1996.

"Full Scale Field Trials of Tire Chips as Lightweight Retaining Wall Backfill-At Rest Conditions," Tweedie, J.J., Humphrey, D.N., and Sandford, T.C., Transportation Research Board No. 1619, Transportation Research Board, Washington, D.C., p. 64-71, 1998.

"Tire Shreds as Retaining Wall Backfill, Active Conditions," Tweedie, J.J., Humphrey, D.N., and Sandford, T.C, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 124, No. 11, Nov., pp. 1061-1070, 1998.

"Highway Applications of Tire Shreds," Humphrey, D. A 7-hour short course presented in each of the six New England States, 1998.

E4. NETC Reports, Papers And Presentations 1995-2000 (Cont'd):

**Project
Number**

Title

N/A

Tire Chips As Lightweight Backfill For Retaining Walls, Phase II: Full-Scale Testing (cont'd):

Papers and Presentations (cont'd):

"Highway Applications of Tire Shreds," Humphrey, D. A 7-hour short course presented in each to the RI DOT, April 1999.

N/A

New England Vehicle Classification And Truck Weight Program, Phase I

Reports:

"New England Vehicle Classification and Truck Weight Program, Technical Report No. 1: Toward the Development of a Vehicle Classification Program for New England," Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

"New England Vehicle Classification and Truck Weight Program, Technical Report No. 2: Toward the Development of a Truck Weight Program for New England," Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

"New England Vehicle Classification and Truck Weight Program, Technical Report No. 3: Supplemental Analysis of Truck Weight Data Collection at SHRP Continuous Count Stations," Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

"New England Vehicle Classification and Truck Weight Program, Phase I," Final Report, Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T. and Shuldiner, P., April 1996, NETCR2.

Papers and Presentations:

"An Analysis of Vehicle Class and Truck Weight Patterns in New England," Collura, J. and Orloski, F. Presented at the 1994 National Traffic Data Acquisition Conference, Rocky Hill, Connecticut, September 18-22, 1994.

"New England Vehicle Classification and Truck Weight Program," Collura, J. and Orloski, F. Presented to the Transportation Research Board's Highway Traffic Monitoring Committee, Annual Meeting of the Transportation Research Board, Washington, D.C., January 1995.

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number
N/A**

Title

Bridge Rail Crash Test, Phase II: Sidewalk-Mounted Rail

Reports:

"NETC 2-Bar Curb-Mounted Bridge Rail Design - Plans and Specifications."
Revised January 1997.

"NETC 4-Bar Sidewalk-Mounted Bridge Rail Design - Plans and Specifications."
January 1997.

"Crash Testing and Evaluation of the NETC 2-Bar Curb-Mounted Bridge Rail,"
Mak, K.K., and Menges, W.L., February 1998, NETCR10.

"Full-Scale Crash Evaluation of the NETC 4-Bar Sidewalk Steel Bridge Railing,"
Kimball, C.E., and Mayer, J.B., March 1999, NETCR14.

Papers and Presentations: None

94-1

Structural Analysis Of New England Subbase Materials And Structures

Reports: None

Papers and Presentations:

"Structural Analysis of New England Subbase Materials and Structures," Davis, J.
Presented at the Rhode Island Transportation and Civil Engineering Forum,
Kingston, Rhode Island, October 23, 1996.

"Structural Analysis of New England Subbase Materials and Structures."
Presented at the Northeast Graduate Student Symposium on Applied Mechanics,
University of Rhode Island, April 26, 1997.

"Structural Analysis of New England Subbase Materials and Structures."
Presented at the Rhode Island Transportation and Civil Engineering Forum,
University of Rhode Island, October 15, 1997.

"Structural Analysis of New England Subbase Materials and Structures," Davis,
J., Huston, M., and Lee, K.W. Presented at the 1998 Annual Transportation
Research Board Meeting.

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number**

Title

94-1

**Structural Analysis Of New England Subbase Materials And Structures
(cont'd):**

Papers and Presentations: (cont'd)

"Structural Properties of New England Subbase Materials of Flexible Pavements."
Presented at the 5th International Conference on the Bearing Capacity of Roads
and Airfields on July 9, 1998.

"Characterization of Subbase Materials of Flexible Pavements With and Without
Reclaimed Asphalt Pavement, K. Wayne Lee, Jeffrey Davis and Sekhar Vajhalla.
Presented at the 199 World Congress for Korean Scientists and Engineers, July 7,
1999.

"Characterization of Subbase Materials of Flexible Pavements With and Without
Reclaimed Asphalt Pavement, K. Wayne Lee, Jeffrey Davis and Sekhar Vajhalla.
Presented at the 12th Rhode Island Transportation Forum, University of Rhode
Island, October 15, 1999.

94-2

**Nondestructive Testing Of Reinforced Concrete Bridges Using Radar
Imaging Techniques**

Reports: None

Papers and Presentations:

"Bridge Deck Structural Monitoring Techniques," Huston, D. Presented at the
New England State Materials Engineers Association Conference, Burlington,
Vermont, October 9, 1996.

"Bridge Deck Evaluation with Ground Penetrating Radar," Huston, D., Maser, K.,
Weedon, W., Fuhr, P.L., and Adam, C., *Structural Health Monitoring*, Chang F.,
Editor, Technomic Publishing, pp. 91-109 Proceedings of the International
Workshop on Structural Health Monitoring, Stanford, California, September 1997.

"Ground Penetrating Radar for Nondestructive Evaluation of Concrete Bridge
Decks," Adam, C., M.S. Thesis Department of Mechanical Engineering University
of Vermont, September 1997.

"Bridge Deck Evaluation with Ground Penetrating Radar," Huston, D., Master, K.,
Hu, J.Q., Weedon, W., and Adam, C. Proc. GPR '98 7th International Conference
on Ground-Penetrating Radar, The University of Kansas, Lawrence, KS, May 27-
30, 1998.

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

| Project Number | Title |
|---------------------------|---|
| 94-2 | Nondestructive Testing Of Reinforced Concrete Bridges Using Radar Imaging Techniques (cont'd): |

Papers and Presentations (cont'd):

"Bridge Deck Evaluation with Ground Penetrating Radar," Huston, D., Hu, J.Q., Pelczarski, N., and Esser, B. Proc. Second International Conference on Structural Health Monitoring, Stanford University, September 1999.

"GIMA Antenna Design for Ground Penetrating Radar in Concrete NDE Application," Hu J.Q., Huston, D. and Fuhr, P. SPIE paper 3670-63, SPIE Conf. On Sensory Phenomena and Measurement Instrumentation for Smart Structures and Materials, Newport Beach, CA, March 1999.

"Ground Penetrating Radar for Concrete Bridge Health Monitoring Applications," Huston, D, Hu, J.Q., Maser, K., Weedon, W., and Adam, C. SPIE 3587-23 Proceedings SPIE NDE Techniques for Aging Infrastructure and Manufacturing, Newport Beach, CA, March 1999.

"Electromagnetic Interrogation of Structures," Huston, D. Fourth Army Research Office on Smart Structures, State College, PA, August 1999.

GIMA Ground Penetrating Radar System for Infrastructure Health Monitoring," Huston, D.R., Hu, J.Q., Maser, K., Weedon, W., and Adam, C., Journal of Applied Geophysics 43 (2000) 139-146.

"Wireless Electromagnetic Interrogation of Structures," Huston, D., Pelczarski, N., Fuhr, P, Arms, S., and Esser, B. Accepted pending revision, Smart Materials and Structures, March 2000.

"Good Impedance Match Antenna (GIMA) Design and Its Applications for Ground Penetrating Radar in Concrete Structures NDE Applications, Hu, J. Q., QM.S. Thesis, Department of Mechanical Engineering, University of Vermont, March 2000.

"Damage Detection in Roadways with Ground Penetrating Radar," Huston, D.R., Pelczarski, N., Esser, B., and Master, K. GPR 2000, 8th International Conference on Ground Penetrating Radar," Gold Coast, Australia, May 2000.

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number**
94-2

Title
**Nondestructive Testing Of Reinforced Concrete Bridges Using Radar
Imaging Techniques (cont'd):**

Papers and Presentations (cont'd):

"Damage Assessment in Roadways with Ground Penetrating Radar," Huston, D.R., Pelczarski, N., Esser, B., and Maser, K., SPIE Conference on Nondestructive Evaluation and Health Monitoring of Aging Infrastructure, 3995A-55, Newport Beach, CA March 2000.

94-3

Procedures For The Evaluation Of Sheet Membrane Waterproofing

Reports:

"Procedures for the Evaluation Sheet Membrane Waterproofing," Korhonen, Charles, J., Buska, James S., Cortez, Edel R., and Greatorex, Alan R., August 1999, NETCR13

Papers and Presentations: None

94-4

Durability Of Concrete Crack Repair Systems

Reports: None

Papers and Presentations:

"Durability of Concrete Crack Repair, Projects," Robinson, J. Presented at the University of Rhode Island Graduate Seminar Series, Kingston, RI, November 19, 1997.

"Durability of Concrete Crack Repair System," Tsiatas, G. and Robinson, J. Presentation to representatives of the Chemical Grouting Division of Kajima Corporation (Japan), University of Rhode Island, College of Engineering, October 26, 1999.

95-1

**Use Of Tire Chip/Soil Mixtures To Limit Frost Heave And Pavement
Damage Of Paved Roads**

Reports: None

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number
95-1**

**Title
Use Of Tire Chip/Soil Mixtures To Limit Frost Heave And Pavement
Damage Of Paved Roads (cont'd)**

Papers and Presentations:

"Laboratory and Field Measurement of the Thermal Conductivity of Tire Chips for Use as Subgrade Insulation," Humphrey, D., Chen, L.H. and Eaton, R. A paper submitted to the Transportation Research Board for presentation at the session on "Properties of Unconventional Aggregates" at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

"Highway Applications of Tire Shreds," Humphrey, D. A 7-hour short course presented in each of the six New England States, 1998.

"Highway Applications of Tire Shreds," Humphrey, D. A 7-hour short course presented to the RI DOT, April 1999.

"Field Trial of Tire Shreds as Insulation for Paved Roads," Humphrey, D., Chen, L.H., Lawrence, B. A paper presented at the 10th International Conference on Cold Regions Engineering: Putting Research into Practice, held in Hanover, NH, August 16-19, 1999.

95-2 Suitability Of Non-Hydric Soils For Wetland Mitigation

Reports:

"Suitability of Non-Hydric Soils for Wetland Mitigation," Final Report, Brannaka, L.K. and Evans, C.V., February 28, 1997, NETCR5.

Papers and Presentations: None

**95-3 Implementation And Evaluation Of Traffic Marking Recesses For
Application of Thermo-Plastic Markings On Modified Open Graded Mixes**

Reports: None

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number
95-3**

**Title
Implementation And Evaluation Of Traffic Marking Recesses For
Application of Thermo-Plastic Markings On Modified Open Graded
Mixes (cont'd)**

Papers and Presentations:

"Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes," Lee, K.W. Presented at the Rhode Island Transportation and Civil Engineering Forum, Kingston, Rhode Island, October 23, 1996.

"Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open- Graded Mixes," Lee, K.W. Presented at the Rhode Island Transportation and Civil Engineering Forum, University of Rhode Island, October 15, 1997.

95-5

Buried Joints In Short Span Bridges

Reports: None

Papers and Presentations:

"State of the Art Study of Bridge Joint Systems in New England," Tsiatas, G. and Chandrasekaran, S. Submitted for presentation at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

95-6

Guidelines For Ride Quality Acceptance Of Pavements

Reports:

"Guidelines for Ride Quality Acceptance of Pavements, "Final Report, Collura, J., El-Korchi, T., Black K., Chase, M. and Li, J., April 1997, NETCR 6.

Papers and Presentations: None

96-1

Implementation of Superpave

Reports:

"Superpave Implementation," Mahoney, James, Stephens, Jack E., September 1999, NETCR18.

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number
96-1**

**Title
Implementation of Superpave (cont'd)**

Papers and Presentations: None

96-3

Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides

Reports: None

Papers and Presentations:

"Inorganic Matrices for Composites," NSF Workshop on Composites, Hanover, NH, March 15, 1998.

"Behavior of Geopolymer Reinforced with Various Types of Fabrics," SAMPE 1998, Anaheim, CA, May 1998.

"Use of Ferrocement Theory for Analysis of High Strength Composites," Ferrocement VI, Ann Arbor, MI, June 1998.

"Advances in Composites," National University of Singapore, July 19, 1998.

"Effectiveness of Fiber Reinforced Composites as Structural and Protective Covering Bridge Elements Exposed to Deicing-Salt Chlorides," Visiting Scholar Lecture, Transportation Forum, University of Rhode Island, October 15, 1999.

"Advanced High Strength Fiber Composites," U.S.-Germany Workshop, Mainz, Germany, May 16-19, 1999.

"Recent Advances in Fiber Composites," Seminar Series, University Catalauna, Spain, June 28, 1999.

"Inorganic Coatings for Transportation Infrastructures," Geopolymer Conference, St. Quentin, France, July 2, 1999.

"State-of-the-Art: Fiber Reinforced Concrete," NSF Faculty Workshop, Northwestern University, Evanston, IL, July 21, 1999.

"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.

E4. NETC Reports, Papers and Presentations 1995-2000 (Cont'd):

**Project
Number
96-3**

Title

Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides (cont'd)

Papers and Presentations (cont'd):

"Durability of Carbon Composites made with Inorganic Matrix, Garon, R., and Balaguru, P., "SAMPE", November 2000, pp. 34-43.

"Inorganic Matrix - High Strength Fiber Composites," University of Missouri, Rolla, July 27, 2000.

"Comparison of Inorganic and Organic Matrices for Strengthening of Reinforced Concrete Beams", Kurtz, S., and Balaguru, P., Journal of Structural Engineering ASCE, V 127, January 2001, pp. 35-42.

"Durability of High Strength Composite Repairs under Scaling Conditions," Garon, R., and Balaguru, P., Proceedings of Third International Conference on Concrete Under Severe Conditions, Vancouver, Canada, June 2001 (in print).

Durability of High Strength Composite Repairs under Scaling Conditions," CONSEC 01, June 2001 (to be presented).

97-1

A Portable Method To Determine Chloride Concentration On Roadway Pavements

Reports: None.

Papers and Presentations: None.

97-2

Performance Evaluation And Economic Analysis Of Combinations Of Durability Enhancing Admixtures (Mineral And Chemical) In Structural Concrete For The Northeast U.S.A

Reports:

"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. NETC Reports, Papers And Presentations 1995-2000 (Cont'd):

**Project
Number
97-2**

Title
**Performance Evaluation And Economic Analysis Of Combinations Of
Durability Enhancing Admixtures (Mineral And Chemical) In Structural
Concrete For The Northeast U.S.A**

Reports (cont'd):

"Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast U.S.A," *Internal Interim Report Prepared for the New England Transportation Consortium*, Lafave, J.M., Civjan, S.A., Lovett, D., and Sund, D.J., July 2000.

"On the Use of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete," Lafave, J.M., Lovett, D., and Civjan, S.A., *ACI Fall Convention*, Toronto, Ontario, Canada, October 15-21, 2000.

"Performance Evaluation of Combinations of Durability Enhancing Admixtures in Concrete - Review and Experimental Program," *Report in Partial Fulfillment of Master of Science in Civil Engineering Degree*, Lovette, D., Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, February, 2001.

Papers and Presentations: None

97-3

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

Report:

"Performance Specifications for Wood Waste Materials as an Erosion Control Mulch and as a Filter Berm," Demars, Kenneth R., Long, Richard P., Ives, Jonathan R., April 2000, NETCR20.

97-4

Early Distress Of Open-Graded Friction Course (OGFC)

Report:

"Early Distress in Open-Graded Friction Course," Stephens, Jack E., Mahoney, James M., Dougan, Charles E., July 1999, NETCR16.

Papers and Presentations: None

E4. NETC Reports, Papers And Presentations 1995-2000 (Cont'd):

**Project
Number
99-1**

**Title
Bridge Rail Transitions**

Report: None

Papers and Presentations: None

99-3

Development Of Priority Based Statewide Scour Monitoring Systems In New England

Reports: None

Papers and Presentations:

"Real-Time Bridge Scour Assessment and Warning," Di Stasi, J.M. and Ho, C.L., *Proceedings of International Symposium: Technical Committee No. 33 on Scour of Foundations*. Melbourne, Australia, pp. 337-352.

99-4

Quantifying Roadside Rest Area Usage

Reports: None

Papers and Presentations: None

99-6

Analytical and Experimental Investigation Of The Effects Of Concrete Removal Operations On Adjacent Concrete That Is To Remain

Reports: None

Papers and Presentations:

"Enhancing the Students' Learning Process Through Interaction Project Between Academia and Industry. " Presented and published in the Abstract of ASEE 2000 at the University of Massachusetts, Lowell, April 2000.

"The Effect of Powerful Demolition Equipment on the Remaining Part of the Concrete Bridge," Masih, R. Presented and published in the proceedings of the Second International Conference on Computational Methods for Smart Structures and Material. Madrid, June 2000.

"Effect of Demolition on Remaining Part of Concrete Bridge, Numerical Analysis Vs. Experimental Results." Presented and published in the proceedings of Internationales Kolloquium uber die Anwendungen der Informatik in Architektur und Bauwesen, Germany, June 2000.

E4. NETC Reports, Papers And Presentations 1995-2000 (cont'd):

**PROJECT
NUMBER**

TITLE

99-6 Analytical and Experimental Investigation Of The Effects Of Concrete Removal Operations On Adjacent Concrete That Is To Remain (cont'd)

Papers and Presentations (cont'd):

"The Effect of Bridge Rehabilitation on the Remaining Structural Parts."
Presented and published in the proceedings of the ASCE conference at Stanford University, August 2000.

00-1 Ground-Based Imaging And Data Acquisition Systems For Roadway Inventories In New England - A Synthesis Of Practice

Reports: None

Presentations: None

00-2 Evaluation Of Permeability Of Superpave Mixes

Reports: None

Presentations: None