Approved Research Projects
From the fall 2005 call for Research

C-06-04: Bridge Deck Wearing Surfaces $250,000
Nova-Chip is currently in use as a standard preventive maintenance treatment for pavements. It has also been used on bridges as a wearing surface. The performance of this material on bridge decks has not been well documented. The goal of this project is to document actual performance of Nova-Chip as well as several other more expensive materials commonly used as bridge deck wearing surfaces. The results will determine if the low cost outperforms the more expensive materials.

C-06-05: Automatic Vehicle Classification System (AVC) $175,000 (50% share; remainder from Thruway Auth.)
The goal of this project is to increase the reliability of the Thruway’s E-ZPass system and increase the mobility of customers by researching and developing an Automatic Vehicle Classification System that would verify the tag class of vehicles in dedicated E-ZPass lanes. Once implemented the system would eliminate the need for E-ZPass customers to use staffed lanes when they are in a vehicle of a different class than that programmed on their E-ZPass tag. These conditions occur when a tandem vehicle must enter the Thruway system as a single, when a passenger vehicle hauls a trailer, and other times when a vehicle axle or height are different than what is registered for the E-ZPass tag.

C-06-06: Open Highway Tolling Testing Facility $252,500 (50% share; remainder from Thruway Auth.)
The goal of this project is to build a test facility on the NYS Thruway to facilitate the testing of “over the highway” technologies. The current funding requested for this project is for construction of the facility only. Additional funds will be needed for research projects for developing various technologies including:

- An open highway E-ZPass toll collection design for a three lane highway with full shoulders configuration. The current design for open highway E-ZPass toll collection can only accommodate a two lane with full shoulder configuration. New software and hardware configurations will need to be developed and tested in true field conditions to assure the high level of reliability required for tolling applications.
- An open highway Automatic Vehicle Classification (AVC) system that will electronically identify the proper toll class for vehicles at highway speeds.
- Next generation open road tolling concept testing, including Dedicated Short Range Communication (DSRC) and License Plate Recognition (LPR).
- Roadside to vehicle communication for non toll applications (e.g. safety, traffic management) as part of the national Vehicle Infrastructure Integration (VII) initiative.
- Non intrusive traffic data sensors and systems.

C-06-07: Potential for Natural Brine for Anti-Icing and De-Icing $125,000
The goal of this project is to test the viability and develop protocols for using natural brine from the Onondaga Creek valley-fill aquifer for winter highway maintenance. A pilot project is proposed between the City of Syracuse, Onondaga County, and New York State DOT to utilize this natural brine to improve wintertime highway safety while saving diminishing governmental funds through use of a local salt (brine) resource.

C-06-08: Develop Guidelines for Traffic Signal Energy Back-Up Systems $100,000
Traffic signals go dark during power outages. Generators are a logistical nightmare and battery back up is problematic and expensive. The need is to develop guidelines for selecting the type and locations for back-up systems to insure cost effectiveness. Alternatively, the need is to improve upon the existing options or develop a new one w/o the shortcomings of the other types, fuel cells may be a practical solution. For the years 2003 and 2004, 80-90% of dark signal accidents result in injuries compared with 33% for the average accident in NY.
C-06-09: Living Snow Fences $195,000
The goal of this project is to develop training and information so that Department Program Service Centers and Maintenance Residencies can design and install the most appropriate living snow fences for a given location. Snow is a major impediment to mobility and reliability during winter. Use of shrub willows and other vegetation offers the opportunity to limit or eliminate blowing and drifting snow on State highways with an attractive, durable mechanism. Reducing or eliminating blowing snow will reduce accidents. To the extent that living snow fences reduce frequency of snow and ice operations, this research proposal could reduce accidents in Department snow fighting equipment or accidents with our equipment and other vehicles. While instructing on installing living snow fence, we can reinforce existing messages about Department worker safety on the right of way.

C-06-10: Temporary Rumble Strips $150,000
The objective of this program is to develop a self-deploying and retrieving rumble strip that can be used as a warning device in construction or accident zones and is suitable for high speed applications. The self-deploying and retrieving feature will permit a highway worker, police or fire officer to deploy and retrieve the rumble strip without having to walk across the highway. The temporary rumble strip will not affect the surface finish of the pavement. The rumble strip will be secured to the shoulder of the road.

C-06-11: Lateral Protection in Short-Term Highway Maintenance Work Zones $200,000
The objective of this project is to develop a device* or system to provide lateral protection in short term highway maintenance work zones to prevent intrusion of errant vehicles from along side the operation. This application exists for both stationary and slow moving operations on the pavement and on the shoulder of the highway. This will be accomplished by the development and crash testing of a lateral protection prototype system. A suggested approach for preliminary design includes a portable reeled cable belting or steel wire rope system supported between heavy trucks. The steel wire rope system could be similar to standard wire rope guide rail systems anchored at either end and perhaps supported by flexible vertical members. The significant difference, however, is the need for extreme ease of “set-up” and “tear-down” and portability. This project will be combined with 99-05 to evaluate all current technologies available for mobile lateral protection.

* The Balsi Beam truck mounted, expandable protective beam protects highway workers in a mobile work zone. The beam was developed by Caltrans and the FHWA. Several prototype beams have been built and tested in California. New Jersey and other States are interested in implementing the beam for highway worker safety in mobile work zones. At this time no company is manufacturing the beam. However, New Jersey and other states are proposing to acquire the plans from the FHWA and fabricate the beam (about $80,000). This study effort will assist the NYSDOT in fabricating the beam, implementing the beam on selected construction and maintenance projects and training of workers in its use. The study will include a video presentation for NYSDOT management to inform and encourage interest in the beam and improving worker protection.

C-06-12: Assessment of Construction Work Zone Operational Issues in NYS $250,000
The goal of this project is to identify different safety improvement strategies and delay minimization schedules at New York work zones. Speed limit compliance studies performed at highway construction work zones in the New York State show that the speeds of drivers in active work zones are significantly higher than the posted speed limits. Recently, there has been an alarming increase in non-compliance of the speed limits thereby endangering both workers and drivers. The proposed work comes on the heels of one of the worst work zone accidents in New York State history. On May 20, 2005 three highway workers, two from Binghamton, one from Cincinnatus, were tragically killed in a work zone on Interstate 81 in the Town of Chenango when a charter bus, reportedly speeding, struck a tractor trailer and started a chain reaction leading to the deaths. Consequently, it is highly critical and timely to identify traffic control devices aimed at reducing speeds thereby protecting workers from deadly accidents within New York work zones and in the efficient scheduling of work zone lane closures to minimize delays and improve safety.
Postings and permit policies are important for effective mobility of the overload vehicles. Bridge load ratings are also used in calculating the bridge sufficiency rating which partly determines Federal HBRR funding. Under an FHWA mandate NYSDOT will have to revise its current policies regarding bridge rating and overweight vehicle routing. This project was rated a number one priority by the Structures Division. The project consists of; 1. A systematic program to update existing data, procedures, and policies; 2. Draft procedures and policies, to meet new standards, for implementation by the Department. Bridge load ratings are the primary parameter used in issuing overload permits. Accurate bridge load ratings are essential in reviewing overload permit applications submitted by the hauling companies transporting goods.

This proposal seeks to develop guidelines for inspection and retrofitting of bridges following an earthquake event. The guidelines will allow engineers and technical personnel, with little to no specific knowledge of seismic design, to be able to perform post-earthquake inspection and propose appropriate solutions to retrofit damaged bridge members. Currently, there is no systematic procedure on which bridges should be inspected immediately following an earthquake and critical details needing inspection depending on structure type. The project should: a) establish guidelines for bridge selection and prioritization considering safety, structure type, route, mobility for emergency response, locality, and economical impacts among other relevant items, b) Develop appropriate guidelines to assist professional engineers, who routinely do not inspect bridges, to inspect bridges following an earthquake based on expected types of failures; and c) offer suggestions for immediate repairs for opening critical bridges based on expected failures.

The passage of the bond program will result in an increase use of consultants and corresponding work for the Consultant Management Bureau. The core business of the Consultant Management Bureau is negotiation of consultant contracts to fulfill anticipated tasks at agreed upon resource levels. Better knowledge of resources requirements leads to substantial savings in consultant costs, faster negotiations, fewer supplemental agreements, more efficient use of existing budgets, and all around better management of consultant allocations. Yet, accurately estimating consultant costs is currently dependent on contacting the “right” person who has had experience with a similar project. This research would correct that problem by creating an estimating tool, drawing upon an historical database and trends under certain variables.

Testing of the existing terminal has been mandated by the FHWA. This research will confirm the acceptability of the existing terminal or allow us to develop a safe system as a replacement to what is currently used. If the crash testing results shows the current end terminal is acceptable we will be allowed to continue using the type II terminal or develop a generic alternative to the type II box beam end terminal that will provide significant cost savings over proprietary terminals.

This project is to test the box beam stiffening of unanchored temporary concrete barrier (TCB). Sections of box beam guide rail will be fastened to the back of TCB to determine maximum deflection of the system under NCHRP TL3 condition. Stiffening the TCB system and reducing the deflection without the need to anchor the barrier to the road or bridge will result in improved safety in work zones since it is anticipated that less travel lane width would have to be taken to accommodate the barriers deflection.

The research would identify design and product failures of traditional materials when used for crosswalks, roundabouts or traffic calming methods and document NYSDOT’s analysis, evaluation and usage of Prismo/Jarvis Imprint and Tryegrip Products in crosswalks, roundabouts, and for pavement marking for traffic calming. The goal would be to develop a best practices guide for these products.

Deterioration of the wearing surface on FRP bridge decks is a significant problem interfering with increased use of FRP decks. The goal of this project is to develop a guide for selection, installation, monitoring, inspection, and maintenance for wearing surfaces on FRP bridge decks. The results of the proposed research will improve the reliability of the FRP
bridge decks as an alternative to conventional bridge decks and improve safety on FRP bridge decks as a durable wearing surface material would provide excellent skid resistance. Successful development of durable wearing surface for FRP bridge deck would accelerate the adoption of these durable non-corrosive and environmentally friendly bridge decks.

**C-06-20: Performance of Aggregates Crushed to Meet the 100/95 Angularity** $150,000
The results of this research could allow the specifications to be changed so that local aggregates can be used for Hot Mix Asphalt and will result in more competition between aggregate suppliers in western NY. The research is to determine if the gravel aggregates crushed to meet the 100/95 coarse aggregate angularity can be used for ≥ 30 million ESAL Superpave mixes. The Superpave specifications require coarse aggregate consensus property for mixes used on ≥30 million ESALs projects meet a 100/100 coarse aggregate angularity. Essentially, this requirement eliminates all gravel sources from being used. In 2003, National Center for Asphalt Technology (NCAT) performed a research on behalf of Lopke Products, Binghamton, NY, to test whether the gravel from Lopke source crushed to meet the 100/98 requirements would perform equal to those aggregate crushed to meet the 100/100 angularity requirements. Based on the results of this research, the Materials Bureau revised the specifications to allow the use of aggregates from this source meeting the 100/98 coarse aggregate angularity for ≥30 million ESALs projects. Because this study by NCAT was performed on gravel aggregates from the Lopke gravel source, additional research needs to be performed on gravel aggregates statewide before any decision is made for use on a statewide basis. It is a known fact that not all gravel sources are the same.

**C-06-21: Performance of Cold In-Place Recycling In NYS** $200,000
The Department has used Cold In-place Recycling (CIPR) as a pavement corrective maintenance and rehabilitation treatment for over 10 years. Anecdotal evidence exists indicating that CIPR is consistently less expensive and more effective at delaying the return of pavement cracking than alternative treatments such as two-course hot mix asphalt (HMA) overlays. This research project is intended to establish the performance of CIPR projects constructed in New York. In order to facilitate this performance analysis, a database will be compiled of all pertinent design and construction data available for all CIPR projects constructed on New York state highways to-date. Construction and design data on CIPR projects have been collected by the Materials Bureau, Regional Materials, Regional Maintenance, Regional Construction and CIPR contractors. The database constructed as part of this project will compile data from all of these sources and serve as a home for data from future CIPR projects. Detailed information will be collected on pavement and subgrade conditions, drainage, and materials. This information will be analyzed to determine what factors most affect the service life of CIPR projects. The results will be used to revise existing specifications and procedures for CIPR.

**C-06-22: Evaluation of Bridge Deck Concrete Scaling** $150,000
In recent years the New York State Department of Transportation, and many municipalities, have observed an increase in concrete scaling of bridge decks. It is well known that the combination of de-icing chemicals and frost can cause serious deterioration of the surface structure of concrete, termed scaling. Flaking and spalling are the noticeable signs of this type of destruction. In reinforced concrete structures, serious scaling is capable of destroying the entire concrete cover, resulting in loss of adhesion of steel to concrete, and consequently loss of structural capacity. Such a mechanism would make the service life predictions of the structure based on chloride ingress (and reinforcement corrosion) completely irrelevant. In un-reinforced structures (pavements), scaling begins as an aesthetic issue, but subsequently can lead to rough riding surfaces requiring large scale repair. It has been reported that concretes containing supplementary cementitious materials (SCM) like fly ash are more susceptible to scaling than concretes with only Portland cement as the binder. However, the use of SCMs is vital to producing high performance concretes (HPC). Hence there is a need to study the influence of material parameters of HPC on the scaling resistance of such concretes in order to design / modify HPC mixtures that have lesser scaling susceptibility. There is also a need to understand the effects of rate of freezing on scaling behavior. This would pave the way for better material design of HPC to minimize the adverse effects of scaling.

**C-06-23: Evaluation and Specification of Special Use Waterborne Pavement Markings** $150,000
Under this project we will acquire, lab test and apply various types of specialty waterborne markings on various pavements. Applications will be done by NYSDOT Maintenance forces. Materials would include, various high durability waterborne markings from different manufacturers, at various wet film thicknesses and using various types of reflective elements. Also included would be specialty waterborne markings with colder weather application capabilities and rheologically modified waterborne markings for application on thin non-structural overlays. Markings will also be applied in grooves milled into the pavement to evaluate enhanced durability in embedded markings. Markings will be tested for retroreflectivity for 3 years after application, on a yearly basis according to ASTM procedures. Day, night and
wet visual performance as well as durability will also be evaluated. Evaluate the life cycle cost of the various applications versus existing material and application costs.

**C-06-24: Integrated Vegetation Management Decision Support**  $360,000
Develop improvements and a strategic plan to the program and practices of integrated vegetation management on NYSDOT road sides. Develop a system and demonstrations to best manage roadside vegetation with environmentally-sensitive, lowest-maintenance, and cost-effective methods. NYSDOT, as with transportation agencies nationally, is regularly challenged regarding its use of herbicides, regarding its response to inadequately controlled vegetation along the ROW and regarding its response to invasive species. Well researched and balanced procedures, rationale and decisions incorporating information on the performance, benefits, and risks of vegetation control alternatives (mowing, herbicides, paving, other options, etc.) are needed to communicate and implement best practices and procedures. This project builds on the results of a previously completed research project that developed an assessment matrix, a preliminary system for NYSDOT to compare impacts and effectiveness of treatments and an initial assessment of NYSDOT’s IVM program.

**C-06-25: Field Portable Quantum Dot-based Hydrocarbon Sensors**  $300,000
The original research project was completed and device was developed. This project would develop a library of quantum dot-based nanocomposite sensing materials for use in the sensitive and selective detection of hydrocarbon pollutants in soil and water samples. This enabling technology will provide future cost reductions in the analysis of soil and water samples for the most common pollutants encountered on DOT construction projects and at maintenance facilities. NYSDOT spends approximately $10M/yr. to sample, analyze and dispose of contaminated soil. Using on-site sensing technologies can significantly reduce costs by reducing delays and disposal.

**C-06-26: Development of Biocontrol(s) and Implementation Plan for Phragmites**  $250,000 (plus $250,000 expected from DEC)
Project goal: Develop effective biocontrol(s) and implementation plan for the control of the invasive plant Phragmites. This project responds to a request by the Governor’s Invasive Species Task Force, to control one of the highest priority invasive species in the State. Promising biocontrol agents have been identified in Europe that appear to be host specific. Resources are now required to complete the required federal and state assessments before implementation on a control program.