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Item 1
High Risk Crash Analysis
ARIZONA DEPARTMENT OF TRANSPORTATION
FHWA-AZ-05-558 • 2006

In agencies with jurisdiction over extensive road infrastructure it is common practice to select and rectify hazardous locations. Improving hazardous locations may arise during safety management activities, during maintenance activities, or as a result of political pressures and/or public attention. Commonly a two-stage process is used. In the first stage the past accident history of all sites is reviewed to screen a limited number of high-risk locations for further examination. In the second stage the selected sites are studied in greater detail to devise cost-effective remedial actions or countermeasures for a subset of correctable sites. Due often to limited time and resources constraints and the extensive number of candidate sites typically considered in such endeavors, it is impractical for agencies to examine all sites in detail. The current Arizona Local Government Safety Project Analysis Model (ALGSP) is intended to facilitate conducting these procedures by providing an automated method for analysis and evaluation of motor vehicle crashes and subsequent remediation of "hot spot" or "high risk" locations. The software is user friendly and can save lots of time for local jurisdictions and governments such as Metropolitan Planning Organizations (MPOs), counties, cities, and towns. Some analytical improvements are possible, however. The objective of this study was to provide recommendations that will lead to improvement in the accuracy and reliability of the ALGSP software for identifying true "hot spots" within the Arizona transportation system or network, be they road segments, ramps, or intersections. The research resulted in 1) a survey of past and current hot spot identification (HSID) approaches, 2) evaluation of HSID methods and exploration of optimum duration of before-period crash data under simulated scenarios, 3) development of safety performance functions (SPFs) for various functional road sections within Arizona, 4) extended comparisons of alternative HSID methods based on SPFs by using real crash data, and 5) recommendations for improving the identification ability of current ALGSP model.
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http://www.azdot.gov/TPD/ATRC/publications/project_reports/PDF/AZ558.pdf

Item 2
AUTOMATED ASSET INVENTORY SYSTEM
ARIZONA DEPARTMENT OF TRANSPORTATION
FHWA-AZ-06-580 • 2006

This report was prepared for the Arizona Department of Transportation (ADOT), to explore options for implementation of a barcode inventory system to track fixed assets on an organization-wide basis. ADOT currently has no department-wide automated fixed asset inventory process nor does it use barcode or other types of technology to track fixed assets. ADOT currently relies on manual inventory methods to maintain their fixed asset information in their fixed asset accounting software. Information on label and ID technologies, bar code hardware and scanning technologies, software applications, and a Pilot implementation are discussed. Since the Pilot Implementation showed that an automated asset inventory system can reduce the amount of time needed to perform a physical inventory as well as increase the accuracy of the results, it is recommended that ADOT further study the automated technology in conjunction with one of the three implementation strategies presented in this report. It is the author's opinion that Strategy Three, the implementation of moderate barcode technology and web or network based data collection, would best suit ADOT's infrastructure. It offers the benefits of both Browser Access as well as barcode technology without committing to a dedicated centralized inventory staff. To recap, Browser Access can be advantageous under a number of situations previously discussed in this report.
Full-text of this report is available for viewing at
http://www.azdot.gov/TPD/ATRC/publications/project_reports/PDF/AZ580.pdf

Item 3
Crash Data Collection and Analysis System
ARIZONA DEPARTMENT OF TRANSPORTATION
FHWA-AZ-06-537 • 2005

The Arizona Department of Transportation (ADOT) is responsible for ensuring the safety and operational efficiency of Arizona's state highways. Fulfilling that responsibility requires extensive data collection and analysis, which are very labor-intensive resource-intensive. Seeking to identify how the agency could accomplish the greatest service improvements with the most efficient use of funds, ADOT engaged ARCADIS to perform a Crash Data Collection and Analysis study and examine the possibilities offered by technological innovations such as Electronic Data Entry (EDE), Relational Database Management Systems (RDBMS), and Geographic Information Systems (GIS). The study resulted in a comprehensive report with three components: an examination of best practices in use in the United States today, a use case and gap analysis examining ADOT's current data work, and a technical memorandum outlining how changes could be implemented. Together, the three parts point to a path to introduce best practices in ADOT's crash-analysis systems. Adopting the best practices outlined can reduce the resources required to maintain these systems, freeing those resources to other safety-related concerns.
Full-text PDF of this report is available for free download at
http://www.azdot.gov/TPD/ATRC/publications/project_reports/PDF/AZ537.pdf

Item 4

Evaluation Of Off-Ramp Right Turn Control At Single Point Urban Interchanges Without Frontage Roads

ARIZONA DEPARTMENT OF TRANSPORTATION
FHWA-AZ-06-556 • 2006

This study focused on the control of the off-ramp right turn movement at SPUIs without frontage roads. The objective of this research project was to evaluate the safety and efficiency of traffic control for off-ramp right turns. For the purposes of this project, two common forms of off-ramp right turn traffic control were investigated: signal control and yield control. The process followed during this research focused on two main aspects of the off-ramp right turn movement: safety and operations. The project was composed of the following stages: literature review, safety analysis and operation analysis. Literature Review: A literature review was conducted to provide the research team a broader perspective on other studies concerned with this aspect of SPUIs. The review was looking for the various traffic controls and interchange configurations that could particularly affect the safety and operation efficiency of off-ramp right turn movement. Safety Analysis: Long-term trends in crash occurrences and short-term observations of conflicts at six study sites (12 off-ramp locations) were analyzed. Crash rates and conflict rates were determined in order to compare and contrast the two means of assessing safety as well as how they relate to the type of the traffic control used at the off-ramps. Operations Analysis: Detailed traffic data collected at the study sites was used to calculate actual delays for off-ramp right turn movements at the study sites. This field data was also used to conduct simulations of interchange, which supplemented the calculations based on the limited sample of study sites. The simulation models provided a means of testing different combinations of off-ramp right turn control types and overall interchange conditions in order to determine the effects of signal and yield control.
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Item 5

Evaluation of Capping Systems for High-Strength Concrete Cylinders

ARIZONA DEPARTMENT OF TRANSPORTATION
FHWA-LA-06-415 • 2006

This study focused on the effects of capping systems on the compressive strength of high-strength concrete. The compressive strength levels ranged from 6,000 psi to 14,000 psi. The three systems investigated were ground ends, bonded caps, and unbonded pads. The capping compounds investigated were commercially available and advertised for testing high-strength concrete. The unbonded pads used were neoprene pads with a Shore A Durometer hardness of 70. A specialty grinding machine was used to obtain the required planeness and perpendicularity on the ground end cylinders. Statistical analyses were used to determine if any significant differences existed between the compressive strength results of the capping methods. No significant difference was found between the capping systems at the 6,000 psi, 10,000 psi, and 14,000 psi levels. However, significant differences were detected at the 8,000 psi and 12,000 psi levels. For the 8,000 psi group, ground ends produced significantly lower compressive strengths than three of the capping compounds. For the 12,000 psi group, ground ends produced significantly lower strengths than one of the capping compounds and the unbonded pads. No other clear statistical distinctions could be made from the analysis performed. In all the strength levels but the 6,000 psi level, the ground ends method produced lower compressive strengths than the rest of the methods under study.
Full-text PDF of this report is available for free download from
http://www.ltrc.lsu.edu/pdf/2006/fr_415.pdf

Item 6

Evaluating Concrete Bridge Deck Performance

MONTANA DEPARTMENT OF TRANSPORTATION

FHWA/MT-06-006/8156-002 • 2005

Since the service life of concrete bridge decks designed by traditional procedures is often shorter than desired, their ability to withstand constant and heavy use in a variety of operating environments is of major concern. In this project, the relative performance of three bridge decks constructed with different concretes and reinforcing steel configurations was studied to help determine which deck offers the best performance over time. To achieve this objective, an array of strain and temperature instrumentation was embedded in each of the bridge decks prior to placing the deck concrete. The decks were tested under controlled live loads to characterize their structural behavior. The first set of such tests was performed immediately after the bridge decks were completed, and the second was conducted two years later. The long term performance of the three decks under environmental loads (notably, changes in temperature) was studied by continuously monitoring selected strain gages in each bridge, and by conducting periodic visual distress surveys and corrosion tests. In the data collected and analyzed from the live load tests and environmental response monitoring of the three decks, only subtle behavioral differences have been observed. While some aspects of the response have been found to statistically differ between bridges and over time, the significance of these differences remains uncertain, as the bridges are relatively young, and they only exhibit nominal signs of distress. The significance of these differences may become clear in the future, if substantial differences in deck durability and performance emerge over time. The visual distress surveys have found that the majority of the cracking that has occurred in the decks is near the integral abutments and that the Empirical deck had the most extensive cracking in this regard. The analysis presented herein generally serves as a baseline for the relative condition of the three bridges before prolonged demands from traffic and the environment. Should a follow-on project be initiated, data obtained from continued long-term monitoring and live load testing will likely provide a more complete body of evidence from which to ascertain which deck design offers superior performance. Relative to cost, initial expense for each deck was similar, thus the relative cost-to-benefit for the decks will be dependent on the service life that they offer. Full-text PDF of this report is available for free download from
http://www.mdt.mt.gov/research/docs/research_proj/high_concrete/final_report.pdf

Item 7

Summary Report on the Performance of Epoxy-Coated Reinforcing Steel in Virginia

VIRGINIA TRANSPORTATION RESEARCH CENTER
FHWA/VTRC 06-R29 • 2006

From 1992 to 2006, the Virginia Transportation Research Council and its contract researchers conducted a long-term systematic series of investigations to evaluate the corrosion protection effectiveness of epoxy-coated reinforcement (ECR) and to identify and recommend the best and most cost-effective corrosion protection system for Virginia bridge decks. This report summarizes this research and subsequent efforts to implement alternative reinforcement. The work was conducted, and is reported, in this general order: | review of historical performance of ECR, ECR performance in solutions and concrete, and preliminary field investigations | investigation of field performance of bridge decks built with ECR | assessment of alternative corrosion protection methods | development of probabilistic service life models for bridge decks and laboratory assessment of ECR cores extracted from bridge decks to determine service life extension | efforts to implement alternative reinforcement. The series of studies demonstrated that the epoxy coating on ECR naturally degrades in the highly alkaline moist environment within concrete. The subsequent loss of bond, coupled with the inevitable flaws in the coating induced by construction, leads to an estimated service life benefit of ECR of as little as 3 to 5 years. Further, non-critical decks, beams, and substructure elements not exposed to marine environments, particularly on secondary and rural routes, can be cost-effectively constructed and maintained using low-permeability concrete and black reinforcing bar. However, because the Federal Highway Administration requires the use of corrosion-resistant reinforcement, and because ECR cannot provide adequate corrosion protection for structures designed for a 100-year+ service life as currently recommended by FHWA, the report recommends that the Virginia Department of Transportation amend its specifications regarding the use of ECR to require the use of corrosion-resistant metallic reinforcing bars such as MMFX2, stainless steel clad, and solid stainless steel.
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Item 8

Performance of a pile-supported embankment

VIRGINIA TRANSPORTATION RESEARCH CENTER
FHWA/VTRC 06-R36 • 2006

The purpose of this study was to evaluate the field performance of the first pile-supported highway embankment constructed in Virginia. The project involved construction of an approach to the new bridge over the Mattaponi River, replacing the existing Lord Delaware Bridge at West Point. The scope of work included field instrumentation and data gathering as related to stress transfer and settlement. The objective was to measure actual soil pressures that are exerted at the geotextile fabric bridging pile caps and to measure stresses acting over pile caps. In addition, data analysis was to be carried out to provide information that VDOT engineers could use to optimize future designs of pile-supported embankments. This report contains field monitoring data and analysis. Prestressed concrete piles were driven at 7-ft (2.1 m) spacing and topped with 3 ft by 3 ft (0.9 m by 0.9 m) precast concrete pile caps. Several layers of high-strength geosynthetic fabric were used for base reinforcement. The maximum embankment height was approximately 6 ft (1.8 m). Earth pressure sensors installed onsite confirmed the formation of soil arching in the embankment fill between columns. Numerical analysis pointed to the large impact of the upper foundation soil layer properties on the magnitude of the final embankment settlement and fabric strain. This shows that accurate material characterization is essential for a cost-effective design. Construction of the pile-supported embankment was carried out by a general contractor. No specialized equipment or methods were required. A rapid increase in the subgrade bearing capacity was observed as the construction proceeded. This method appears particularly well suited to time-critical projects.
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Item 9

Field Demonstration of Magnetic Tomography Technology for Determination of Dowel Bar Position in Concrete Pavement

VIRGINIA TRANSPORTATION RESEARCH CENTER
FHWA/VTRC 06-R40 • 2006

The purpose of this study was to demonstrate and evaluate the use of magnetic tomography technology through the use of Magnetic Imaging Tools' (MIT) MIT Scan-2. The main objective was to measure the alignment of dowel bars in a few jointed plain concrete pavements in Virginia and demonstrate the applicability of the technology. The MIT Scan-2 was obtained on loan from the Concrete Pavement Technology Program. This program is managed by the Federal Highway Administration (FHWA) through a partnership with state highway agencies, industry, and academia. Dowel alignment measurements were successfully performed on both mechanically inserted dowel bars and bars on dowel baskets. Although the verification with field coring showed reasonably accurate measurements, signal interference from uncut dowel baskets, the presence of foreign metal in nearby locations, and bars deeper than 8 in can result in unreliable quantitative results. The repeatability of the measurements for bars on dowel baskets showed general agreement with the data reported from FHWA. The device was found to be user-friendly, and its field operation was simple. Thus, there is a potential benefit from using the MIT Scan-2 as a quality assurance tool for detecting dowel bar misalignment in jointed plain concrete pavement in Virginia.
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Item 10

Lime Application Methods

KANSAS DEPARTMENT OF TRANSPORTATION

K-TRAN: KU-02-2 • 2006

High calcium lime is widely used for the modification and stabilization of subgrades composed of fine-grained soils. Lime is available in a variety of forms and may be applied using several methods. This report contains the results of a study on the mixing of different forms of lime with two soils in a laboratory and field settings. The forms of lime used in the lab were quicklime, dry hydrated lime, and slurries made from each of these dry products. For the field evaluation two sites with two different soils were selected. At each site quicklime was applied using a vane spreader (best technology) and spreading of a windrow of dumped lime with a blade (oldest technology). Slurry produced on site from slaked quicklime was used for the third subsection. Results from the laboratory evaluation showed the form of lime added to the soil (quicklime, dry hydrated lime and slurry) appears to have little effect on the moisture-density relationship under completely mixed conditions. Swelling was minimal for all lime treated samples however pH testing showed the amount of lime added to the Paola South test section was too low to achieve true stabilization, based on low unconfined strengths and pH testing. This is likely a result of the use of a single statewide specification for the amount of lime to be used. Field results showed that changes in the lime application method (slurry, vane spreader and blade) appeared to have a limited to negligible affect on the strength of the subgrades. Proper control of moisture and mixing, and adding sufficient lime for stabilization, had a greater impact on subgrade properties. The results suggest that long term strengths are similar, if not greater for lime treated soils compacted well above optimum than those soils compacted at or near optimum moisture. The number of passes made over the subgrade during the mixing process made a substantial difference in the unconfined compressive strength of the samples, even after four passes. Remixing and re-compaction after mellowing also resulted in a significant improvement in strength and contributed to the breakdown of remaining soil lumps. During application and mixing of the quicklime it was observed that significant amounts of lime dust were blown into the surrounding environment. Blowing lime presents some health and visibility risks to construction personnel and nearby traffic, and represents the loss of some product. No blowing dust was produced during the application of slurry. Due to the potential hazards presented by blowing lime dust, it is recommended that slurry be specified for projects in sensitive areas.

Item 11

Field Instrumentation and Analysis of the Tuttle Creek Bridge

KANSAS DEPARTMENT OF TRANSPORTATION

K-TRAN: KU-04-5 • 2006

Fatigue cracking has been an extensive problem for many steel bridges designed prior to the identification of fatigue-prone details. Distortion in bridges coupled with stress concentrations within bridge components can eventually lead to crack initiation. The Tuttle Creek Bridge, built in 1962, has developed fatigue cracks like many older steel bridges. The structure is a 5,350 ft. long, plate-girder bridge with two girders supporting a non-composite concrete deck. The majority of the cracks on the bridge are found in the upper web-gap region, which lies between the vertical connection stiffener and the upper flange. Cracks also have occurred in the transverse welds attaching the lateral gusset plates to the lower flange. Both these crack types are believed to be caused by differential deflection of the two girders. In 1986, the bridge was retrofitted to prevent further cracking. Cracking, however, continued after the 1986 retrofit. In 2000, the Kansas Department of Transportation retained the services of the University of Kansas to investigate the fatigue cracking. Finite element models were created to estimate the stresses in the upper web-gap regions in order to determine a proper repair plan. The recommended repair scheme was to positively attach the connection stiffener to the upper flange, which was also successfully performed in similar web-gap repairs. The University of Kansas also was retained to perform two load tests on the bridge to investigate the effectiveness of the repair. The first load test, which this report entails, examined the stresses within the fatigued regions prior to retrofit. A second test will be conducted after the repairs have been performed. Measurements taken during both tests will be compared to determine the fatigue improvement within the structure. Also, information gathered during the first test will also provide insight to improving the finite element models. This report includes information about the Tuttle Creek Bridge and a summary of its structural deficiencies. Details of the gage installation and load testing are provided. Stresses induced by the truck loadings are presented in addition to the inferences from the measurements taken.

Item 12
US-69 Surface Texture and Noise Study
KANSAS DEPARTMENT OF TRANSPORTATION
KS-05-3 • 2006

The components of noise generated by roadways comprise of noise from the engine, exhaust and tires. Changing the surface texture will impact the noise generated by the tire/pavement interface. The objective of this study was to study the effects of different surface textures on the noise generated by the roadway and the effects of the surface texture on surface friction and smoothness. The surface textures investigated in this study are Astroturf drag, Carpet Drag, Longitudinal tining, and Grinding sections with groove widths of 0.110", 0.120", and 0.130". In addition to these surface textures the effects of single saw-cut joints vs. normal saw-cut joints and changing the effective wheelbase of the 0.130" grinding sections were also investigated. Tests were performed in each section to evaluate the sections performance in Sound, Friction and Surface Profile. The Sound tests consisted of a Close Proximity Test and a Pass-by Test. The Friction tests consisted of the Skid Test and Sand Patch Test. The Surface Profile tests consisted of a South Dakota Profilometer, a Model 6000 lightweight profilometer, and a California type profilograph. The results from the Pass-by test with a truck indicated that the engine noise was the dominant component of noise emitted from a roadway when the grade is uphill. These uphill sections had the highest noise levels and the surface texture had little impact. The results from the Pass-by test with a car were all within 3.0 dBa. In the results from the Close Proximity test with a car the longitudinal section was 4.2 dBa greater than the noise from the grinding sections. This indicates that the additional engine noise that is measured in the Pass-by test negates some of the effects of surface texture on lowering the sound level. The test sections were ranked based on the results of the tests and the grinding sections with 0.120" groove spacing performed the best. The longitudinal tining sections were ranked the lowest.

Item 13

Development of Bilateral Data Transferability in the Virginia Department of Transportation's Geotechnical Database Management System Framework

VIRGINIA TRANSPORTATION RESEARCH COUNCIL
VTRC 06-CR4 • 2006

An Internet-based, spatiotemporal Geotechnical Database Management System (GDBMS) Framework was designed, developed, and implemented at the Virginia Department of Transportation (VDOT) in 2002 to retrieve, manage, archive, and analyze geotechnical data using a distributed Geographical Information System methodology. As the use rate of the GDBMS Framework grew, VDOT engineers recognized that additional engineering analysis and design functionalities could be incorporated. In response, five geotechnical engineering applications (DRIVEN, RSS, LPILE Plus, SHAFT, and GALENA) that are used to calculate slope stability, pile, and shaft capacity were identified. An Analysis and Design Module (ADM) for these five applications was developed and implemented in 2004. In 2005, additional automated file upload capability (Bilateral Data Transferability, BDT) was developed and implemented to allow VDOT engineers and geologists to upload completed geotechnical data files, with a pre-screening and QA/QC check prior to the final posting on the GDBMS server. This BDT module was implemented based on the latest gINT geotechnical data template and library used at VDOT. In addition, a new functionality to export dynamically generated fence diagrams into MicroStation in a DXF format was developed and implemented in GDBMS.
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http://www.virginiadot.org/vtrc/main/online%5Freports/pdf/06-cr4.pdf

Item 14

Evaluation of the Strength of Cement-Treated Aggregate for Pavement Bases

VIRGINIA TRANSPORTATION RESEARCH COUNCIL
VTRC 06-CR7 • 2006

Cement-treated aggregate (CTA) is commonly used to provide a stable base for pavements that are placed over weak soil subgrades. Because CTA reduces the thickness of the aggregate required to provide a durable base by approximately one-half, using it as a bearing layer for pavement can limit the quantity of unsuitable soil that must be excavated and removed, and can reduce the erodability of the stabilized soils. However, the field performance of CTA is variable, even when prepared according to set standards. This laboratory-based investigation explored the effects of fines content, cement content, mineralogy, and freeze/thaw cycling on the unconfined compressive strength of cement-treated aggregate. The mineralogy of the base aggregate was found to make a significant difference in the strength of the CTA, with strength increasing in the following order: mica, limestone, and diabase. The granite aggregate yielded variable results, but the strengths were generally on the order of those determined for the diabase aggregate. The pH of the samples also correlated well, with the measured strengths increasing as the pH increased. As was anticipated, increasing the cement content increased the measured unconfined compressive strength of cylinders that were not subjected to freeze/thaw cycling. The same basic trend was observed in cylinders that were subjected to freeze/thaw cycling; however, the increase was less pronounced in the cylinders that were subjected to physical abrasion during thaw cycles. The fines content did not significantly influence the unconfined compressive strength of the cylinders that were not subjected to freeze/thaw cycling; however, the fines content appeared to confer a protective effect to the durability of the cylinders that were subjected to freeze/thaw. For the freeze/thaw test conditions, the unconfined compressive strength increased as the fines content was increased.
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Item 15

Laboratory Investigation of Air-Void Systems Produced by Air-Entraining Admixtures in Fresh and Hardened Mortar

VIRGINIA TRANSPORTATION RESEARCH COUNCIL
VTRC 06-R27 • 2006

The air-void systems produced by two commercially available air-entraining admixtures (AEA), one a vinsol resin formulation and the other a tall oil formulation, were studied in mortars. Mortars were composed of four different portland cements and two Class F fly ashes (20 percent by mass) with concrete sand. The mortar proportions were based on Virginia Department of Transportation Class A4 concrete with a water-cementitious material ratio of 0.45. Foam index tests were conducted on all cementitious combinations, and the results were used to determine the dosage of AEA in the mortars. The air content of the mortars was determined gravimetrically, and specimens were cast for subsequent linear traverse analysis of the air-void system. With both AEAs, mortar air contents in the target range produced spacing factors much lower than necessary to provide resistance to freezing and thawing, suggesting that the ranges for air content currently used in VDOT specifications could be reduced to lessen the potential for acceptance problems associated with excessive air content. Further study is recommended to verify that the relationships observed in this study are also observed in concrete and to define improved air content specifications.

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Item 16
Development and Evaluation of Virginia's Highway Safety Corridor Program
VIRGINIA TRANSPORTATION RESEARCH COUNCIL
VTRC 06-R30 • 2006

On July 1, 2003, legislation went into effect that established a highway safety corridor (HSC) program for Virginia. The intent of the HSC program is to address safety concerns through a combination of law enforcement, education, and engineering countermeasures. Fines for violations in the highway safety corridors are doubled, subject to a $200 minimum for criminal infractions and a $500 maximum for traffic offenses. The Code of Virginia required the Commonwealth Transportation Commissioner, in conjunction with the Commissioner of the Department of Motor Vehicles and the Superintendent of the Virginia State Police, to develop criteria for designating and evaluating highway safety corridors. The legislation required that this process include a review of "crash data, accident reports, type and volume of vehicular traffic, and engineering and traffic studies." This report documents the results of a study to develop a method to designate HSCs on Virginia's interstate and primary systems. The impacts of the HSC program on interstate crashes and speeds are also presented. The framework for the interstate program described was adopted and applied by the Virginia Department of Transportation, resulting in the installation of three HSCs around the state. The results of an evaluation of the data for 2004 indicate that the program did not produce a benefit in terms of safety or speed reduction, although the results were based on only 1 year of data. Preliminary crash data for 2005 indicate that a positive safety benefit may have occurred at the I-81 and I-95 Richmond HSCs. A rigorous analysis of the 2005 data could not be performed since comparison site data were not yet available, but the preliminary data seem promising. The HSC program currently does not have any dedicated resources with which countermeasures may be implemented; this may limit the potential effectiveness of the program. Additional effects might be observed if dedicated resources were available to allow a more systematic approach to enforcement, education, and engineering within the designated HSCs. Further analysis of the HSCs using at least two more years of data should be performed to gain a more accurate picture of whether the HSCs have had a positive safety benefit.
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Item 17
Laboratory Comparison of Several Tests for Evaluating the Transport Properties of Concrete
VIRGINIA TRANSPORTATION RESEARCH COUNCIL
VTRC 06-R38 • 2006

The transport properties of concrete are a primary element in determining the durability of concrete. In this study, several new test methods that directly measure aspects of fluid and ionic transport in concrete were examined. ASTM C 1543 and ASTM C 1556 provide the means for determining the apparent chloride diffusion coefficient, which is the controlling parameter for chloride ion migration in saturated pore systems. The chloride diffusion coefficient is an important input in service-life models for reinforced concrete. ASTM C 1585 measures the rate of absorption of water into the capillary pore system at a standard degree of saturation and thus provides a measure of fluid ingress and movement in concrete subject to drying conditions. These methods more accurately and completely describe the means of transport in concrete and should help improve the understanding and assessment of these important characteristics.
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Item 18

A Qualitative Study of the Core Functions of Smart Traffic Centers at the Virginia Department of Transportation

VIRGINIA TRANSPORTATION RESEARCH COUNCIL
VTRC 06-R39 • 2006

The Virginia Department of Transportation's (VDOT) Smart Traffic Centers (STC) were established to address the growing problem of increased congestion caused by traffic demand exceeding roadway capacity. Initially, the core function of the STC was simply to get information to the public. However, VDOT's STCs were established at different times with different approaches to meet regional traffic needs. As a result, practices, processes, organizational structures, and relationships with other VDOT functions vary widely among STCs. With this complexity, the definition of the STCs core functions has evolved. To develop a clear understanding of these core functions, a group composed of STC operations managers was formed and this study was undertaken. The study found that the core function of VDOT's STCs has expanded beyond disseminating information to the public, although that activity remains a critical tool of traffic and incident management. Specifically, STCs have four core functions: (1) traffic management, (2) incident management, (3) emergency operations/emergency management, and (4) regional networking. Incident management activities and events define the vast majority of work and, therefore, drive the development of systems, procedures, policies, and relationships with communities, agencies, and private companies with whom an STC must work on a daily basis. Further, the study determined that a fully developed Safety Service Patrol (SSP) greatly enhances the functionality of the STC. Where the SSP is fully operational, the STC's ability both to gather information and to interact directly with the public and other state, local, and federal agencies is complete. Without a functional SSP, the STCs ability to manage incidents directly (and therefore traffic) is limited, impaired, or disabled. In addition, the study found that STCs are VDOT's most direct link to the public and that regional networking is critical to successful STC operations. VDOT's STCs are, therefore, critical to coordinating and working directly with local, state, and federal agencies. This is particularly clear in regions such as Northern Virginia and Hampton Roads, where the large number of cites and communities that directly abut increases the number of responder agencies and organizations. The inherent complexity of such regions requires careful coordination and networking to ensure the safe and efficient management of incidents and emergencies and to mitigate their impact on regional traffic flow. The recommendations offered in this report will help coordinate STC development. Although there will always be some variation because of regional needs, STC practices will benefit from increased and continual sharing of information and practices across locations. Fully developed SSPs are arguably the single most practical and powerful resource an STC has to manage incidents, as well as to develop strong relations with the public, local communities, and other agencies. Because of the necessary interface with communities, cities, and agencies at multiple levels, STCs are perfectly situated to develop regional relationships and structures; therefore, regional strategies for traffic operations should be shared among STC locations.

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Item 19

Assessing the benefits of Traveler and Transportation Information Systems

WASHINGTON STATE TRANSPORTATION CENTER

WA-RD 597.1 • 2006

The goal of advanced traveler information systems (ATIS) is to provide travelers with information that will facilitate their decisions concerning route choice, departure time, trip delay or elimination, and mode of transportation. The benefits of ATIS projects can be evaluated through field studies, simulation software, and surveys. An evaluation method called the ITS Deployment Analysis System (IDAS) is suggested for use by the Washington State Department of Transportation (WSDOT). IDAS is a "sketch" planning tool intended for screening and prioritizing all intelligent transportation systems (ITS) projects (not just ATIS projects). The software evaluates a number of benefits. These are determined by changes attributable to the deployment of ITS in vehicle miles traveled (VMT), vehicle hours traveled (VHT), volume-capacity (v/c) ratios, and vehicle speeds throughout a given network. The IDAS evaluation depends on a number of assumptions that affect the calculations of costs and benefits. The IDAS developers recommend that these assumptions be inspected by local agencies and adjusted to better represent local conditions. The assumptions about the impacts on VMT, VHT, v/c ratios, and vehicle speed are particularly important. Consequently, suggestions are made within this report for adjustments that WSDOT should make to these default values. These values will allow the WSDOT to successfully employ IDAS for ATIS evaluation.

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Item 20

The Automated use of Un-Calibrated CCTV Cameras as Quantitative Speed Sensors - Phase 3

WASHINGTON STATE TRANSPORTATION CENTER

WA-RD 635.1 • 2006

The Washington State Department of Transportation (WSDOT) has a network of several hundred closed-circuit television (CCTV) traffic surveillance cameras that are deployed for congestion monitoring on the freeways and arterials around Seattle. The goal of the first two phases of this project was to create algorithms that would allow these cameras to make continuous quantitative measurements of vehicle speed. In the first two phases, a number of algorithms were developed and tested; the most successful of these was chosen for implementation in this, Phase 3. The goal of this third phase was to implement the algorithms as prototype software.

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