

REVIEW

Published by the Nevada Department of Transportation

Volume 11 Number 2

RESEARCH DIVISION

Spring Issue, 2002

RESEARCH BULLETIN

Where Does the Money Come From and How Much Do We Have?

Where does the funding come from and how much do we have for the department's research, development and technology transfer (R,D&T) program? This is a frequently asked two-part question. The short answer is the Federal Highway Administration (FHWA) and slightly more than a million dollars. The long answer is a little bit more complicated.

Beginning with ISTEA and continuing in TEA-21, each state DOT must spend at least 25% of its total State Planning and Research (SPR) funds on R,D&T activities annually. The SPR funds are a "take down" or "set aside" of 2% of the department's total federal-aid program. What does this equate to for NDOT? For FY (federal fiscal year) 2002, the department's total SPR

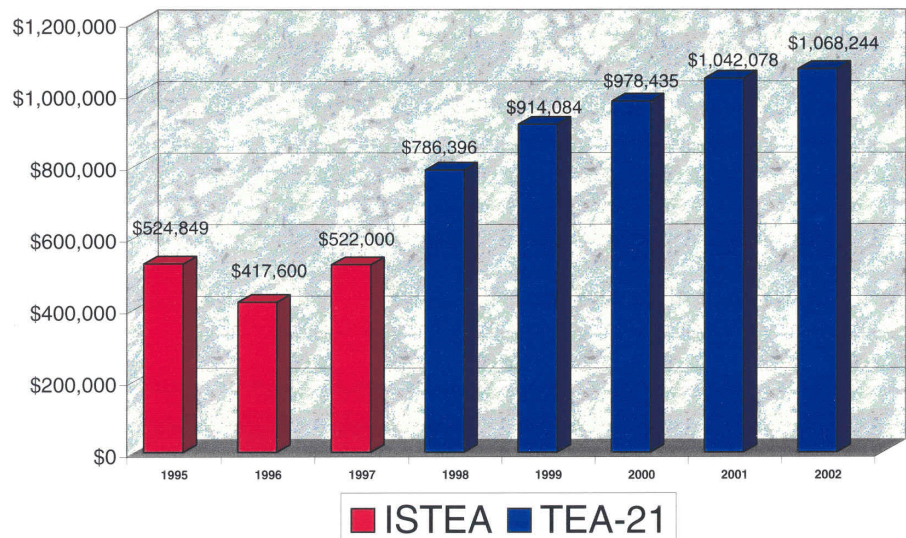
apportionment is \$4,272,975; the resulting 25% minimum expenditure for R,D&T is \$1,068,244. The apportionment is strictly federal funds. With the exception of FHWA-approved pooled-fund projects and the National Cooperative Highway Program (NCHRP), the department must provide a match of 20% in state funds.

Now, before we are deluged with research proposals, I must inform you that there are a number of ongoing costs that essentially take funds off-the-top of the apportionment thus reducing the amount available for department-sponsored research projects. Such costs are: the NCHRP, the Transportation Research Board (TRB) research correlation service subscription,

and of course, research-program administrative costs (salaries for Research Division personnel). In addition, there are currently a number of ongoing projects with a duration of longer than one year for which funds need to be earmarked for the "out" years. So, the bottom line is that we have about \$150,000 to \$200,000 each year to initiate new projects. Also, state funds, i.e., funds not reimbursed by the FHWA, may be used to fund projects of sufficient merit when federal funds are not available.

Shown below is a graph depicting annual apportionment amounts for R,D&T during ISTEA and TEA-21.

Annual Apportionments for R,D&T (25% SPR)



In This Issue

- Source of Money.....1
- Downtown Viaduct.....2
- Product Evaluation.....3
- PEC Recap.....3

RESEARCH IN PROGRESS

Seismic Evaluation and Retrofit of Las Vegas Downtown Viaduct

The Nevada Department of Transportation recently entered into an Interlocal Agreement with the University of Nevada, Reno (UNR), to assess the seismic vulnerability of the Las Vegas Downtown Viaduct carrying I-515. At a total budget of \$450,000 including a \$97,000 match by the State Applied Research Initiative and overhead adjustment, the three-year project aims at devising effective seismic retrofit methods that would prevent serious damage to the bridge due to earthquakes, according to the principal investigator of the project, Prof. Saïid Saïidi of the Civil



Fig. 2 Nathan Johnson of UNR prepares a model for shake-table testing.

Engineering Department at the University of Nevada, Reno.

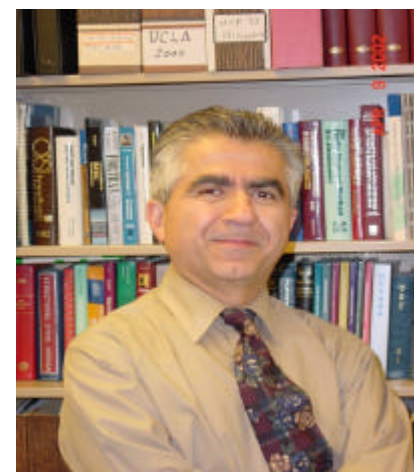
2000 ft. long and covers 24 spans. Adding to the complexity of the research are two off ramp and one on-ramp structures. In addition, the columns and piers have unusual shapes, and seismic retrofit details are being developed from scratch (Fig. 1).

The co-principal investigators of the project are Prof. Ahmad Itani of UNR and Samaan Ladkany of University of Nevada, Las Vegas. Four graduate students and two visiting researchers at UNR are working on the project. The research team is conducting in-depth computer modeling of the bridge and extensive shake-table simulation of large-scale models of the critical bridge elements (Fig. 2). To retrofit the bridge, conventional materials, glass and carbon composite, along with shape memory alloys are being investigated. The research team's goal is to develop reliable and practical retrofit solutions that are cost effective.



Fig. 1 Elevation view of octagonal and diamond shape columns.

The bridge was built in the 1968-69 time period based on standards that satisfied the seismic codes at the time. But much has been learned about the inadequacies of those details and that catastrophic failure could happen even under moderate earthquakes. This is a major bridge and its closure could mean serious economic consequences for Las Vegas and the state. According to Bill Crawford, the NDOT chief bridge engineer, the bridge tops the seismic retrofit priority list in the state even though it is not located in the most active seismic zone in Nevada. The very high average daily traffic carried by the bridge helps place the bridge at the top of the list. The bridge is close to



M. Saïid Saïidi is a professor of Civil Engineering at UNR. He is internationally recognized for his work in earthquake engineering of concrete structures. He is a fellow of ACI and is a registered professional engineer in Nevada and California.

Product Evaluation Committee (PEC) Meeting Recap

APPROVED

NDOT Type IX Retroreflective Sheeting for Traffic Signs

Based on a Traffic Engineering request, the PEC approved a revision to our standard specifications thereby creating a new NDOT Type IX retroreflective sheeting specification. This approval is part of on-going efforts to increase the safety of the motoring public. Establishment of the new Type IX for retroreflective sheeting will enable NDOT staff to address these traffic safety requirements when use of higher retroreflectivity sign sheeting materials is necessary.

Recently, new standards for retroreflective sheeting were issued under the designation ASTM D4956-01 Standard Specification for Retroreflective Sheeting for Traffic Control Materials including new Types for unmetallized, microprismatic sheeting materials used for highway signing, construction zone devices and delineators. To update NDOT specifications for retroreflective sheeting used for permanent signs, Traffic Engineering proposed that new ASTM D4956-01 Types VII, VIII and IX be adopted by NDOT under one NDOT specification. These new types of retroreflective materials are all unmetallized

microprismatic sheetings with different requirements for all three, but Type IX has the lowest requirements for the minimum coefficient of retroreflectivity. Therefore, the others are grouped together under the Type IX category. Other requirements for retroreflective materials such as daytime luminance factors are already grouped for these three types of materials under the new ASTM D4956-01 designation.

APPROVED

Acrylic Adhesive Anchor Systems

Based on recommendations from Bridge and Materials, the PEC approved a revision to NDOT standards by creating a subsection within section 728 that will cover the requirements for acrylic adhesive anchor systems. Acrylic adhesives will be permitted only when site and temperature conditions are suitable for their use.

Current NDOT standards cover only epoxy resin anchoring systems. However, according to the affected divisions, acrylic adhesives offer some advantages over the epoxy adhesives and could be used for certain applications such as dowel bars to be adhered to concrete contact joints when fast setting concrete is used.

Specifications, Materials, Bridge and Research will work together to develop the specifications and acceptance criteria for acrylic adhesives. Those products that meet the established specifications will be

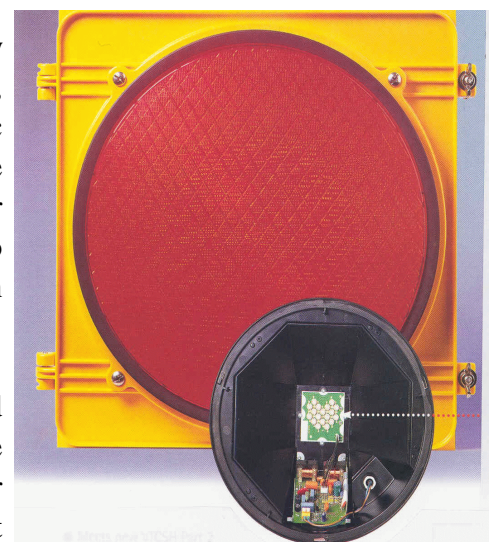
placed on a Qualified Product List (QPL) for acrylic adhesives.

APPROVED

QPL for LED Traffic Signal Head Modules

Based on a recommendation from Traffic, the PEC approved establishment of a Qualified Product List (QPL) for LED traffic signal head modules initially comprised of all models for 12" signal heads and pedestrian signal heads that have been used extensively in the past. A QPL for traffic-head modules is listed under the specification number currently used in the NDOT Standard Specifications.

Light Emitting Diodes (LED) are compounded semiconductor devices that convert electricity to light more

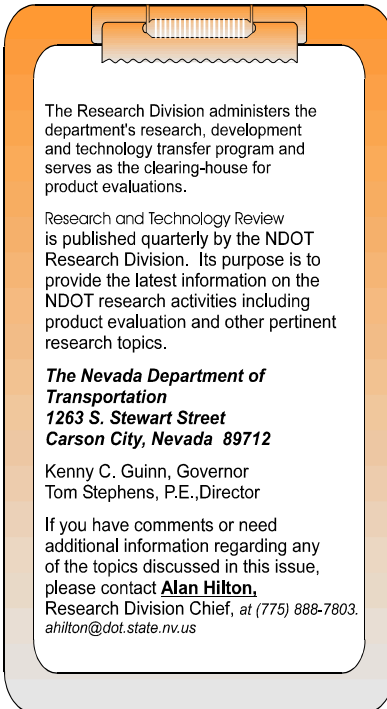


LED Traffic Signal

efficiently and economically than filament bulb fixtures. LEDs are currently being installed as the light source of choice for illumination for monochromatic applications such as traffic signals, etc.

Since the lamps on the initial QPL are interchangeable, local entities will be able to replace lamps without compatibility problems and without maintaining an inventory of a variety of lamps. Furthermore, a QPL will

be of benefit to both the local entities and the department in that it will ensure that poor quality, non-standard LED traffic signal modules will not be used on NDOT projects. Companies seeking to place their products on a QPL will be directed to submit a product evaluation proposal for acceptance under current NDOT specifications for LED traffic signal heads.



The Research Division administers the department's research, development and technology transfer program and serves as the clearing-house for product evaluations.

Research and Technology Review is published quarterly by the NDOT Research Division. Its purpose is to provide the latest information on the NDOT research activities including product evaluation and other pertinent research topics.

The Nevada Department of Transportation
1263 S. Stewart Street
Carson City, Nevada 89712

Kenny C. Guinn, Governor
Tom Stephens, P.E., Director

If you have comments or need additional information regarding any of the topics discussed in this issue, please contact **Alan Hilton**, Research Division Chief, at (775) 888-7803. ahilton@dot.state.nv.us

NDOT LIBRARY RECENT ACQUISITIONS

(Received January 1 through March 31, 2002)

CONSTRUCTION

O-15 Corridor Reconstruction Project (UT-01-08), Utah DOT; **3838**

HYDRAULICS/ENVIRONMENT

Identification of Dispersive Soils in Oklahoma by Physicochemical and Clay Mineral Properties (OKDOT ITEM 97-11), Oklahoma DOT; **951**

A Comparative Review of Wetland Mitigation Practices: Evaluation, Monitoring, Maintenance, Inventory, Staffing, and Funding (UT-01.10), Utah DOT; **3837**

A Comparative Review of Wetland Mitigation Practices (UT.01.10), Utah DOT; **4972**

Environmental Liability Study (Final Report) (CDOT-DTD-R-2000-11), Colorado DOT; **5253**

Evaluation of the Effects of Development on Peak Flow Hydro graphs for Collyer Brook, Main (ME 99-6), Maine DOT; **5998**

Long Term Vegetation and Faunal Succession in an Artificial Northern California Vernal Pool System (FHWA/CA/TL/2001-36), Caltrans; **6206**

Roadway Applications of Vegetation and Riprap for Streamband Protection Synthesis Report (FHWA-OR-RD-02-08), Oregon DOT; **6208**

What is the Best Way to Address Environmental Justice Issues? (FHWA-AZ-02-506), Arizona DOT; **6398**

A Synthesis of the Application and Performance of Three-Sided Precast Box Culverts (UT-02.05), Utah DOT; **6608-6609**

MAINTENANCE

Evaluation & Comparison of Three Chemical Deicers for Use in Colorado (CDOT-DTD-R-2001-17), Colorado DOT; **5242**

Evaluation of BLASTOX, Lead Reducing Shot for Paint Removal on Bridges (FHWA-PA-2001-016-97-4(1)), Pennsylvania DOT; **6019**

A Comparison Between the Use of UDOT's and Contractor's Equipment for Crack Sealing (UT-02.04), Utah DOT; **6527 & 6528**

MATERIALS/PAVEMENTS

Fast Track Concrete for Construction Repair (FHWA 2001-015), New Jersey DOT; **881**

Development of a Design Guide for Ultra Thin White topping (UTW) (FHWA 2001-018) New Jersey DOT; **910**

Effects of Synthetic Air Entraining Agents on compressive Strength of Portland Cement Concrete - Mechanism of Interaction and Rededication Strategy (FHWA 2001-021) New Jersey DOT; **914**

Accelerated Testing for Studying Pavement Design and Performance FY99 (FHWA/KS-99-7), Kansas DOT; **1202**

Evaluation of Cold In-Place Recycled Mixtures on US-283 (KS-99-4), Kansas DOT; **1203**

Forensic Investigation of Early Cracking on I-25 in Denver, Colorado (CDOT-DTD-R-2000-10), Colorado DOT; **5250**

Evaluation of the Effects of Development on Peak Hydrographs for Collyer Brook, Maine (ME 99-6), Maine DOT; **5998**

Materials and Workmanship Warranties for Hot Bituminous Pavements: A Cost Benefit Evaluation (CDOT-DTD-R-2001-18), Colorado DOT; **6642**

PLANNING/PROGRAM DEVELOPMENT

Non-Pricing Methods to Optimize High Occupancy Vehicle Lane Usage (FHWA/CA/OR-2001/21) Caltrans; **413**

Transit Labor Relations Guide (FHWA/CA/OR-9906); Caltrans; **442**

BART to Silicone Valley: How Now? (FHWA/CA/OR-2001/39), Caltrans; **784**

National Symposium and Video conference on Sustainable Transportation (FHWA/CA/OR-2001/40; Caltrans; Colorado DOT; **2066**

Methodology for Determining the Impact of Highway Bypasses in Oklahoma (FHWA/OK 01(03)) Oklahoma DOT; **3709**

Protecting Public Surface Transportation Against Terrorism and Serious Crime: Continuing Research on Best Security Practices (FHWA/CA/OR-2001-29), Caltrans; **6207**

Rhodes-ITMS Tempe Field Test Project (Implement Raised Pavement Markers) (FHWA-AZ-01-447), Arizona DOT; **6395**

Impact of Highways on Property Values: Case Study of the Superstition Freeway Corridor (FHWA-AZ-01-516), Arizona DOT; **6399**

In House Experimental Features UDOT Research 1999 (UT-02-04), Utah DOT, **6527-6528**

NAFTA II California Border Zone Land Transportation Issues (FHWA/CA/OR-2000-10), California DOT; **6529**

Factors Influencing Voting Results of Local Transportation Funding Initiatives with a Substantial Rail Transit Component (FHWA/CA/or-2001-26) (Mineta Transportation Institute), Caltrans; **6531**

Effects of Online Shopping (FHWA/CA/or-2001-35) (Mineta Transportation Institute), Caltrans; **6532**

Performance Measures to Improve Transportation Systems - Agency Operations (TRB 26), TRB; **6535**

Using Networks to Stimulate Transit Oriented Development (FHWA/CA/OR-2001-34), Caltrans; **6606**

Race-Neutral Program Development and Evaluation (FHWA-PA-2002-005-97-04 (84)), Pennsylvania DOT; **6621**

Heavy Axle Study: Impact of Higher Rail Car Weight Limits on Short Line Railroads, Vol I: Final Report (FHWA-PA-2001-011-97-04(1)), Pennsylvania DOT; **6636**

Heavy Axle Study: Impact of Higher Rail Car Weight Limits on Short Line Railroads, Vol II: Final Report Appendices (FHWA-PA-2001-011-97-04(11)), Pennsylvania DOT; **6637**

Annual Workshop on Transportation Needs 2001 Proceedings (UT 01.14), Utah DOT; **6672**

STRUCTURES

Weldable Shear Connector for Glulam Decks on Existing Bridge Girders (FHWA-PA-2001-97-04(97)), Pennsylvania DOT; **182**

Development and Implementation of New Driven Pile Technology (FHWA/OH-99/008), Ohio DOT; **1464**

Evaluation of FRP Prestressed Panels/Slabs for I-225/Parker Road Project (CDOT-DTD-R-2001-14), Colorado DOT; **6097**

Revising the AASHTO Guidelines for Design and Construction of GRS Walls (CDOT-DTD-R-2001-16), Colorado DOT; **6155**

Guidelines for Testing Large Seismic Isolator and Energy Dissipation Devices (CERF#40600), HITEC; **6646**

TRAFFIC/SAFETY

ARAN/GIS Video Integration (ME 9802), Maine DOT; **5997**

Precast Concrete Barrier Crash Testing - Final Report (FHWA-OR-RD-02-07), Oregon DOT; **6032**

Breakaway Sign Post Coupler (Pendulum Tests 4000) (CD ROM), Texas DOT; **6043**

RHODES-ITMS Tempe Field Test Project: Implementation and Field Test of RHODES, A Real-Time Traffic Adaptive Control System (FHWA-AZ01-447), Arizona DOT; **6395**

Enhancing Arizona Department of Transportation's Traffic Data Resource (FHWA-AZ-01-492), Arizona DOT; **6396**

State of the Art Report on Non-Traditional Traffic Counting Methods (FHWA-AZ-01-503), Arizona DOT; **6397**

Analysis of Human Factors in Nighttime Work Zones (FHWA/NJ-2001-025), New Jersey DOT; **6493**

Report 350 Crash Test Full Scale Crash Test (NCHRP video); Texas Transformation Institute; **6572**

REFERENCE BOOKS

CFR's New Edition 7/1/2001

Standard Handbook for Civil Engineering, South Florida Water Management District; **5135**

The Civil Engineering Handbook, Purdue University, Indiana; **5141**

AASHTO 2001 Publications Catalog, AASHTO; **5156**

Catalog of U.S. Government Laws, Regulations, Decisions, and Guidelines, **5188**

Manual on Uniform Traffic Control Devices (Millennium Edition), FHWA; **5691**