

**A NATIONAL UNIVERSITY TRANSPORTATION CENTER
AT MISSOURI UNIVERSITY OF SCIENCE & TECHNOLOGY**

**CENTER FOR TRANSPORTATION
INFRASTRUCTURE
AND SAFETY**

**ADVANCED MATERIALS, TRANSITION-STATE FUELS AND
NON-DESTRUCTIVE TESTING TECHNOLOGIES**

First and Second Year Combined Annual Report

July 1, 2006 – June 30, 2007

July 1, 2007 – June 30, 2008

PART B: RESEARCH PROJECTS STATUS REPORT

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**First and Second Year Combined Annual Report
Part B: Research Projects Status Report**

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PROJECTS STATUS: LISTS BY CURRENT STATUS

The following lists show the status of currently and previously funded projects at the University Transportation Center at Missouri University of Science and Technology. Though the Center was granted National status in 2006, the National Center theme areas and goals are an outgrowth of the former Center's activities. Project lists and statuses from the former Center's activities are included in this reporting to illustrate the continuity and success of our overall activities from start to present.

Note: For all projects listed below a sequence number and a letter designation is attached to each title. R = Research; ETT = Education & Technology Transfer; and RE = Research Equipment.

New Projects

The following 37 projects have not been reported on a previous Research Project Status list:

- Graduate Research Training in Transportation Areas: Year 3 funds (R231)
- Coaxial Cable Sensors and Sensing Instrument for Crack Detection in Bridge (R230)
- 2008 Summer Transportation Institute (ETT229)
- Structural Assessment of Highway "N" Power Substation Under Earthquake Loads (R228)
- A Laboratory Investigation on Three-Sided Structures (R227)
- American Concrete Institute 2008 Fall Conference: Sponsorship and Student Training (ETT226)
- Adding Faculty in Transportation Areas: Year 2 & 3 (R225)
- Outreach for the Missouri University of Science & Technology National University Transportation Center (ETT224)
- Geophysical Investigation of Seepage Associated with the Lake Sherwood Earth Fill Dam (R223)
- Rolla West Task 2, I-44 Interchange Master Plan – Sub consultant service for HNTB (R222)
- Investigation of Subsidence Along Segment of MO Route 65, Springfield, Missouri (R221)
- Missouri Local Technical Assistance Program (LTAP) at Missouri S&T: Year 2 (ETT220)
- Concrete Durability Factor Estimation (R219)
- Quick Test for Percent of Deleterious Material (R218)
- GeoMO 2008 – Geotechnical Earthquake Engineering – Site Response (ETT217)
- Women in Science & Engineering and Minority Engineering Scholarships Year 3 (ETT216)
- Outreach Activities in Support of the Missouri S&T National UTC (ETT215)
- Leaching Behavior of Coal Combustion Products and the Environmental Implication in Road Construction: Year 2 Funds (R214)
- Structural Assessment of Highway "N" Power Substation under Earthquake Loads (R213)
- 6th National Seismic Conference on Bridges and Highways, Charleston, South Carolina, July 27-30, 2008 (ETT212)
- Pultruded Composites Using Soy-Based Polyurethane (R211)
- Freight Optimization & Development in Missouri – Waterways and Ports Module (R210)
- Serviceability and Prestress Loss Behavior of SCC Prestressed Concrete Girders Subjected to Increased Compressive Stresses at Release (R209)
- Mechanical Characterization Of Enamel Coated Steel Bars (R208)
- Concrete Crack and Spalling Detection in a 6.1-meter Precast RC Piles with Novel Distributed Cable Sensors and ETDR Measurement (R207)
- Acquisition of a Leica ScanStation LiDAR Unit (RE206)
- Preparing for a Significant Central U.S. Earthquake: Science Needs of the Emergency Response Community (ETT205)

- Show Me the Road to Hydrogen (R204)
- Graduate Research Training in Transportation Areas Year 2 (R203)
- Geophysical Characterization of Tunnel Construction Site, Louisville, Kentucky (R202)
- Leaching Behavior of Coal Combustion Products and the Environmental Implication in Road Construction: Year 1 Funds (R201)
- Development of Teaching Material to Integrate GT-POWER into Combustion Courses for IC Engine Simulations (R200)
- Missouri Local Technical Assistance Program (LTAP) at Missouri S&T Year 1 (ETT199)
- Development of Hand-held Thermographic Inspection Technologies (R198)
- Design of FRP Systems for Strengthening Concrete Girders in Shear Phase II (R197)
- Women In Science & Engineering and Minority Engineering Scholarships Year 2 (ETT196)
- Long-Term Remote Sensing System for Bridge Piers (R195)

Ongoing Projects

The following 10 projects have been reported on a previous Research Project Status list and are still in progress:

- Design, Construction, Laboratory and Field Testing of the Bridge on the Arnault Branch, Washington County, Missouri (R193)
- Design of FRP Systems for Strengthening Concrete Girders in Shear: Phase I (R186)
- Back Movement Monitor Field Testing (R183)
- Adding Faculty in Transportation Areas Year 1 (Continued) (R180)
- Development and Testing of High Resolution Target Monitor (R174)
- Seismic Simulation and Design of Bridge Columns Under Combined Actions, and Implications or System Response (R159)
- Analyzing Microscopic Behavior of Traffic Flow (R157)
- 6th International Conference on Case Histories in Geotechnical Engineering (ETT150)
- Development and Field Testing of FRP Composite Bridge Decks Comprising of Guard Rail System for Bridge 1480230, Greene County, Mo. (R143)
- Preservation of Missouri Transportation Infrastructure: Flexural upgrade of deficient bridges with composites (R93, R95, R96, R97, R98, R119)

Completed Projects

The following 160 projects have been reported on a previous Research Project Status list and have been completed:

- Missouri Local Transportation Center 2006 (ETT173)
- Workshop on Seismic Retrofit Design of Continuous Span Steel-Girder Highway Bridges (ETT172)
- Mapei Scholar Program (ETT171)
- Transportation Fuel Research and Development (R170)
- Acquisition of a High-Quality Temperature Chamber (RE169)
- GeoMO 2006: Shear Strength and Slope Stability (ETT168)
- Cyclic Load Testing and Acoustic Emission Methods of In-Situ Load Testing: Comparison and Development of Evaluation Criteria (R167)
- Adding Faculty in Transportation Areas Year 1 (R166)
- Graduate Research Training in Transportation Areas (R165)

- Assessment of the Bill Emerson Memorial Bridge Based on Seismic Instrumentation Data (R164)
- Structural Assessment of the I-70 Blanchette Bridge (R163)
- Scholarships for Women and Minority Students Studying Engineering and Science (ETT162)
- Geotechnical Site Characterization of Transportation Construction Sites and Structures (R161)
- Incorporation of Hands-on Experiments in an Introductory Analysis Course (ETT160)
- Dependable Wireless Sensor Networks for Intelligent Infrastructures (R158)
- Influence of Ore Physical Properties on the Transportable Moisture Limit for Barged Materials (R156)
- Field Testing of Soil-Foundation-Structure Interaction Under Explosive Load (R155)
- Stay-in-place (SIP) formwork for Rapid Construction of Corrosion-free Concrete Bridge Decks (R154)
- National Society of Black Engineers National Conference; NSBE Pre-College Initiative; Society of Hispanic Professional Engineers National Conference; MEP/SHPE High School Recruitment (ETT153)
- Minority Engineering and Science Program: Minority Intro to Technology and Engineering, Mathematics Engineering Science Achievement (ETT152)
- Women in Science and Engineering: Girls Lock-In Conference, Summer Solutions, Girls Camp, SWE National Conference Expanding your Horizons (ETT151)
- Travel Support to Establish the Center for Transportation Security (CTS) (R149)
- Manufacturing and Performance Evaluation of Soy Protein Based Plastics and Composites Phase II (R148)
- Summer Transportation Institute 2005 (ETT147)
- Geophysical Detection of Voids within the Levee, Duck Creek Conservation Area, Missouri (R146)
- Geophysics 2006: Conference on Applied Geophysics (ETT145)
- The Effect of Fatigue and Creep on Shear-Critical RC Beams Reinforced with CFRP Laminate Stirrups (R144)
- Experimental Evaluation of FRP Strengthening of Real Size Reinforced Concrete Columns (R142)
- Remote Health Monitoring of Hillsborough County Bridges (R141)
- Minority Intro To Engineering (MITE), Mathematics Engineering Science Achievement (MESA) (ETT140)
- Girls Lock-In Conference; Summer Solutions 2005; SWE National & Regional Conferences (ETT139)
- National Society of Black Engineers National Conference; National Society of Black Engineers Pre-College Initiative; MEP/SHPE Kansas City High School Recruitment Program; MEP Seven Week Summer Enrichment Program for Pre-college Freshmen (ETT138)
- GeoMO 2005 Design of Retaining Walls (ETT137)
- Quality Geotechnical Testing Workshop and Short Course (ETT136)
- Strengthening of Rural Bridges Using Rapid-Installation FRP Technology (R135)
- Manufacturing and Performance Evaluation of Soy Protein Based Plastics and Composites: Phase I (R134)
- Assessment of Bridge Technologies through Field Testing (R133)
- Missouri Local Transportation Resource Center 2005 (ETT132)
- Geotechnical and Bridge Design Workshop: New Madrid Seismic Zone Experience (ETT131)
- Validation and Calibration of Testing Equipment for In-Situ Load Tests (R130)
- Low Energy Alkali Resistant Iron Phosphate Glass Fibers (R129)
- Monitoring of Bridge Structures Equipment (RE128)
- Enhancing Student Awareness and Faculty Capabilities in Transportation (ETT127)
- Evaluation and Utilization of the WP4 Phase II (R126)
- University Student Design Competition Center (USDCC) (ETT125)
- In Situ Load Testing of Bridge A6358 and Bridge A6101 (R124)
- Evaluation of Anchors for CFRP tendons (R123)
- Design, Fabrication, and Testing of Low-Profile Composite Bypass Road Panel: Phase I (R122)
- GeoMO 2004: Geotechnical Uncertainty and Reliability (ETT121)
- SASW/Study of Greater St. Louis and Surrounding Region (R120)

- GPR investigation of bridge deck, Willow Springs, MO (R118)
- Determination of MASW shear-wave velocities at various sites in SE Missouri (R117)
- Acquisition of a Engineering Seismograph (RE116)
- Acquisition of an Impact Testing Machine (RE115)
- Comprehensive Shear-Wave Velocity Study in the Popular Bluff Area, Southeast Missouri (R114)
- GPR and Resistivity to Determine Depth to Bedrock at the Roaring River Hatchery (R113)
- Strut Failures of Paseo Suspension Bridge in Kansas City, Missouri (R112)
- Finite Element Modeling of Reinforced Concrete Bridge Decks with ABAQUS (R111)
- Summer Transportation Institute 2004 (ETT110)
- League of United Latin American Citizens (LULAC) Kansas City H.S. Hispanic Recruitment and Society of Hispanic Professional Engineers (SHPE) National Technical Career Conference (ETT109)
- Experimental Study on Seismic Retrofit Techniques Phase II (R108)
- GeoMO-1: 2003 Deep Foundations for Transportation Structures (ETT107)
- Girls Lock-In Conference, Summer Solutions 2004 (ETT106)
- Minority Intro To Engineering (MITE), National Society of Black Engineers National Conference (ETT105)
- GPR Study of imbedded Dowl Bars, Van Buren, Missouri (R104)
- Southview Bridge Rehabilitation in Rolla (R103)
- Geophysics 2003: Conference on Applied Geophysics (ETT102)
- Soy-Based Composite Sandwich Structure Phase II (R101)
- Determination of Shear Wave Velocity along a Segment of Interstate I-70, St. Louis (R100)
- Missouri Local Resource Center 2004 (ETT99)
- Development and Validation of Steel-Reinforced Polymer (SRP) for Strengthening of Transportation Infrastructures (R94)
- A Study of the Effects of Injected Chemical Soil Stabilizers on Expansive Clays and Claystones (R92)
- Evaluation & Utilization of the WP4 Depowling Potentiometer Phase I (R91)
- Post-earthquake Damage Evaluation of Bridge Structures (R90)
- Experimental Study on Seismic Retrofit Techniques for Cap Beams, Columns and their Connections of Highway Bridges (R89)
- 2003 USDOT Summer Transportation Institute (ETT88)
- Experimental Investigation of Bond-Slip Relationship Between Fiber Reinforced Polymers (FRP) Bars and Concrete (R87)
- Study on Seismic Retrofit Techniques for Cap Beams, Columns and their Connections of Highway Bridges: Phase 1 (R86)
- Creep, Shrinkage and CTE Evaluation: Normal Strength Concrete Bridge Deck Companion Testing for an Adjacent HPC Bridge (R85)
- Expanding Your Horizons in Math, Science, and Technology; Girls Lock-In Conference; Summer Solutions 2003 (ETT84)
- Minority Introduction To Engineering and National Society of Black Engineers National Conference (ETT83)
- FRP Alignment Measurement Using Digital Image Analysis (R82)
- Nondestructive Ultrasonic Detection of FRP De-lamination (R81)
- Evaluation of Bridge Approach Slabs Performance and Design (R80)
- Optimization of HPC for Missouri Bridge Structures (R79)
- Soy-based Composite Sandwich Structures Phase I (R78)
- Micro-Macro Modeling of the External Strengthening of Concrete with Fiber Reinforced Polymer: Phase II (R77A)

- Study to Determine the Effects of Organics on the Results of Quicklime Slurry Treatment of Clay Soils (R76)
- GPR Investigation of Concrete Integrity, Sheppard of the Hills Hatchery, Branson, MO (R75)
- Design and Installation of Torque Anchors for Tiebacks and Foundations (R74)
- The Effects of a Curved Soffit on FRP-Strengthening of Concrete Bridges (R73)
- Determination of Shear-Wave Velocity Profiles from Surface Seismic Waves (R72)
- Dynamic Testing Equipment (RE71)
- Missouri's Local Technical Assistance Program Center (LTAP) (ETT70)
- Fifth International Conference on Case Histories in Geotechnical Engineering (ETT69)
- Structures Laboratory Equipment Enhancement – Hydraulic Distribution System (RE68)
- Sappington Bridge Demolition, Crawford County, MO (R67)
- Strengthening of Martin Springs Outer Road Bridge, Phelps County, MO (R66)
- Assessment and Rehabilitation of West 7th Street Bridge, City of Fulton, MO (R65)
- Rapid Strengthening of Reinforced Concrete Bridges (R64)
- Joint KDOT-MODOT: Evaluation of FRP Repair Method for Cracked PC Bridge Members (R63)
- 82nd Transportation Research Board Student Technology Transfer (ETT62)
- 2002 Summer Transportation Institute (ETT61)
- Highway/Rail Crossing Project Selection (R60)
- Micro-Macro Modeling of the External Strengthening of Concrete with FRP (R59)
- Implementation Issues of Metallic Dampers for Seismic Retrofit of Highway Bridges (R57)
- 2001 Summer Transportation Institute (ETT56)
- Acquisition of an Integrated Testing System for Civil Infrastructure Engineering Research and Education (R55)
- Acquisition of an Integrated Testing System for Civil Infrastructure Engineering Research and Education (RE55A)
- Ground Penetrating Radar Evaluation of Contaminated Concrete Pavement (R54)
- Steel-Free Hybrid Reinforcement System for Concrete Bridge Decks (R52)
- Ground-Penetrating Radar/Seismic Study-Branson/Springfield, MO (R50)
- Characterization of a New FRP Bar for Reinforcement of Concrete (R49)
- Doctoral Training in Civil Infrastructure Engineering (ETT48)
- Determination and Prioritization of MODOT Geotechnical Related Problems with Emphasis on Effectiveness of Designs for Bridge Approach Slabs and Pavement Edge Drains Phase II (R47)
- Course Development for the Transportation Graduate Program at UMR (ETT46)
- Development of a Pull Tester (R45)
- Automated Mobil Highway Sign Retro Reflectivity Measurement (R44)
- National Society of Black Engineers National Conference (ETT43)
- Laboratory and Field Testing of FRP Reinforced Concrete Bridge (R42)
- Micro-Macro Modeling of the External Strengthening of Concrete with FRP (R41)
- USAES-UMR Cooperative Degree Program (ETT40)
- High Performance Concrete for Bridge A6130 – Route 412 Pemiscot County, MO (R39)
- Acquisition of Asphalt Pavement Analyzer (R38)
- Evaluating FRP Repair Method for Cracked PC Bridge Members Subjected to Repeated Loadings (R37)
- Evaluating FRP Repair Method for Cracked PC Bridge Members Subjected to Repeated Loading (R37A)
- Effect of Contaminants on Bond Characteristics of Deformed Reinforcing Bars (R36)
- Summer Transportation Institute 2000 (ETT35)
- Non-Destructive Imaging of Shallow Sandstone in Support of Hydraulic Study of Litho Logic Unit (R34)
- Non-Invasive Geophysical Investigation of Landfill Site: Grandview Triangle Area (R33)

- Assessment/Mitigation of EQ. Hazards Along Designated Priority Emergency Vehicle Access Routes, SE MO (R32)
- CE 401 – Health Monitoring & Retrofit of Geotechnical Systems (ETT29)
- Composite Structures Using Asphalt Based Roofing Scrap Materials (R28)
- Laboratory and Field Testing on FRP Composite Decks for the City of St. James, Phelps County, MO (R27)
- Strengthening of an Impacted PC Girder on Bridge A10062, St. Louis County, MO (R26)
- Structural Integrity Evaluation of RC Columns with FRP Wraps (R25)
- Model of Demonstration Bridge for Classroom and Laboratory Teaching (ETT24)
- Determination and Prioritization of MODOT Geotechnical Related Problems w/Emphasis on Effectiveness of Designs for Bridge Approach Slabs and Pavement Edge Drains (R23)
- Investigation of Agents of Practical Use to Stabilize Slopes & Erosion Along the I-55 Corridor South of Sikeston Phase I (R22)
- Signal Mast Arm Failure Investigation (R21)
- Development of a Prototype Imaging Concrete Roughness Measurement Device (R20)
- Constructability and Performance of CFRP Prestressed Concrete Members (R19)
- Strengthening of Bridge G270, Route 32, Iron County, MO (R18)
- 1999 Summer Transportation Institute (ETT17)
- Web-Based Technology Transfer (ETT16)
- Low Cost Renewable Resin for Pultruded Projects (R15)
- Replacement Pedestrian Bridge at UMR (R14)
- The Influence of Surface Area to Volume Ratio on the Quality Control of High Performance Concrete (R13)
- PCI Girder Cracking Phase II: Causes and Design Detail (R12)
- Destructive and Non-Destructive Test of Bridge J857, Highway 72, Phelps County, MO (R11)
- Comparison of High Performance Steel and Conventional Steel Girder Bridges (R10)
- Cracking in Prestressed I-girder Bridges (R9)
- UTC-Advanced Materials and Non-Destructive Test Technologies/Educator (ETT8)
- UTC Center Evaluation – Self Assessment Process (R7)
- Feasibility Study: Concrete Roughness Measuring Device (R6)
- Minority Introduction to Engineering (ETT5)
- Metallic Dampers for Seismic Design and Retrofit of Bridges (R4)
- Experimental Testing and Modeling of an FRP Box Culvert Bridge (R3)
- Application of Ground Penetrating Radar to Highway Related Problems (R2)
- Route Characterization & Geophysical Survey Feasibility Study of Previously Mined Ground Along Alternate “E” Proposal Highway 71 Bypass, Joplin, MO (R1)

PROJECTS STATUS: TABLES BY FISCAL YEAR

The following tables display the status of currently and previously funded projects at the University Transportation Center at Missouri University of Science and Technology organized by grant year. This representation of project status has been included to illustrate the group of projects selected for funding within a specific fiscal year.

National University Transportation Center (NUTC): Year I and Year II

Year II: July 1, 2007 – June 30, 2008

Seq. No.*	Title	P.I.	Status
ETT216	Women in Science & Engineering and Minority Engineering Scholarships (year 3)	Elmore	N
R219	Concrete Durability Factor Estimation	Richardson	N
ETT220	Missouri Local Technical Assistance Program (LTAP) at MST	Rolufs	N
R221	Investigation of subsidence along segment of MO Rte 65, Springfield, Missouri	Anderson	N
R222	Rolla West Task 2, I-44 Interchange Master Plan – Sub consultant services to HNTB	Rolufs	N
R223	Geophysical Investigation of Seepage Associated with the Lake Sherwood Earth Fill Dam	Anderson	N
ETT224	Outreach for the Missouri University of Science & Technology NUTC	Rolufs	N
R225	Adding Faculty in Transportation Areas: Year 2 & 3	Collier	N
ETT226	American Concrete Institute 2008 Fall Conference: Sponsorship and Student Training	Myers	N
R227	A Laboratory Investigation on Three-Sided Structures	Belarbi	N
R228	Structural Assessment of Highway “N” Power Substation Under Earthquake Loads	Chen	N
ETT229	2008 Summer Transportation Institute	Pickerill	N
R230	Coaxial Cable Sensors and Sensing Instrument for Crack Detection in Bridge	Chen	N
R231	Graduate Research Training in Transportation Areas: Year 3 funds	Myers	N

Table Legend: P = Pending; N = New; N* = New and completed within reporting period; OG = Ongoing; C/R = Complete; D = Discontinued; R = Research; RE = Research Equipment; ETT = Education/Technology Transfer

Year I: July 1, 2006 – June 30, 2007

Seq. No.*	Title	P.I.	Status
R195	Long-Term Remote Sensing System for Bridge Piers & Abutments	Washer	N
ETT196	Women in Science & Engineering and Minority Engineering Scholarships (year 2)	Elmore	N
R197	Design of FRP Systems for Strengthening Concrete Girders in Shear Phase II	Belarbi	N
R198	Development of Hand-held Thermographic Inspection Technologies	Washer	N
ETT199	Missouri Local Technical Assistance Program (LTAP) at Missouri S&T	Rolufs	N
R200	Development of Teaching Material to Integrate GT-POWER into Combustion Courses for IC Engine Simulations	Koylu	N
R201	Leaching Behavior of Coal Combustion Products and the Environmental Implication in Road Construction: Phase 2	Wang	N
R202	Louisville Southern Indiana Ohio River Bridge Project, Kentucky East End Approach Tunnel	Anderson	N
R203	Graduate Research Training in Transportation Areas: Year 2 funds	Myers	N
R204	Show Me the Road to Hydrogen	Sheffield	N
ETT205	Workshop Entitled “Preparing for a Significant Central U.S. Earthquake: Science Needs of the Emergency Response Community”	Anderson	N
RE206	Acquisition of a Leica ScanStation LiDAR Unit	Maerz	N*
R207	Concrete Crack and Spalling Detection in a 6.1-meter Precast Measurements	Chen	N*
R208	Mechanical Characterization of Enamel Coated Steel Bars	Chen	N
R209	Serviceability and Prestress Loss Behavior of SCC Presetstressed Concrete Girders Subjects to Increased Compressive Stresses at Release	Myers	N
R210	Freight Optimization & Development in Missouri-Waterways and Ports Module	Grasman	N*
R211	Protruded Composites Using Soy-Based Polyurethane Resin	KC	N*
ETT212	6 th National Seismic Conference on Bridges and Highways, Charleston, SC July 27-30, 2008	Chen	N*
R213	Structural Assessment of Highway “N” Power Substation under Earthquake Loads	Chen	N
R214	Leaching Behavior of Coal Combustion Products and the Environmental Implication in Road Construction: Phase 3	Want	N
ETT215	Outreach Activities in Support of the Missouri S&T National UTC	Rolufs	N
ETT217	GeoMO 2008 – Geotechnical Earthquake Engineering – Site Response	Luna	N
R218	Quick Test for Percent of Deleterious Material	Richardson	N

Table Legend: P = Pending; N = New; N* = New and completed within reporting period; OG = Ongoing; C/R = Complete; D = Discontinued; R = Research; RE = Research Equipment; ETT = Education/Technology Transfer

University Transportation Center (UTC): Year I through Year IX

Year IX: July 1, 2006 – June 30, 2007

Seq. No.	Title	P.I.	Status
R194	Investigation of Karst features within MoDOTROW	Anderson	C/R
R193	Design, Construction, Laboratory and Field Testing of the Bridge on the Arnault Branch, Washington County, Missouri	Galati	OG
ETT192	Quality Geotechnical Testing Workshop and Short Course	Stephenson	C/R
R191	Best Practices for Implementing a Biodiesel Program	Grasman	C/R
ETT190	GeoMo 2007 - Soil Stabilization - Foundations and Pavements	Luna	C/R
R189	Investigation of Karst Features within Pipeline/Roadway	Anderson	C/R
R188	Detection of Subsurface Zone of Seepage Beneath Earth Fill Dam Phase II	Anderson	C/R
R187	Geophysical Characterization of Soil and Bedrock, Monroe City Bridge	Anderson	C/R
R186	Design of FRP Systems for Strengthening Concrete Girders in Shear: Phase I	Belarbi	OG
ETT185	5th National Seismic Conference on Bridges & Highways	Chen	C/R
R184	Optimization of Electromagnetic Acoustic Transducers (EMATs) for Condition Assessment of Civil Infrastructure	Washer	C/R
R183	Back Movement Monitor Field Testing	Apel	OG
R182	Detection of Subsurface Zone of Seepage Beneath Earth Fill Dam and Beneath Roadway	Anderson	C/R
ETT181	Structural Materials Technology (SMT): NDE/NDT for Highways and Bridges Conference	Washer	C/R
R180	Adding Faculty in Transportation Areas Year 1 (Continued)	Schonberg	OG
ETT179	2006-2007 Summer Transportation Institute	Rolufs	C/R
R178	Leaching Behavior of Coal Combustion Products and the Environmental Implication in Road Conditions	Wang	C/R
R177	Mapping of Underground Voids at Construction Site	Anderson	C/R
ETT176	2007 ICONIC Conference	Zoughi	C/R
R175	Resilient Moduli of Typical Missouri Soils and Unbound Granular Base Materials	Petry	C/R
R174	Development and Testing of High Resolution Target Monitor	Apel	OG

Table Legend: P = Pending; N = New; N* = New and completed within reporting period; OG = Ongoing; C/R = Complete; D = Discontinued; R = Research; RE = Research Equipment; ETT = Education/Technology Transfer

Year VIII: July 1, 2005 – June 30, 2006

Seq. No.	Title	P.I.	Status
ETT173	Missouri Local Transportation Center 2006	Qureshi	C/R
ETT172	Workshop on Seismic Retrofit Design of Continuous Span Steel-Girder Highway Bridges	Chen	C/R
ETT171	Mapei Scholar Program	Krishnamurthy	C/R
R170	Transportation Fuel Research and Development	Krishnamurthy	C/R
RE169	Acquisition of a High-Quality Temperature Chamber	Richardson	C/R
R166	Adding Faculty in Transportation Areas	Mitchell	C/R
R165	Graduate Research Training in Transportation Areas	Krishnamurthy	C/R

Table Legend: **P** = Pending; **N** = New; **N*** = New and completed within reporting period; **OG** = Ongoing; **C/R** = Complete; **D** = Discontinued; **R** = **R**esearch; **RE** = **R**esearch **E**quipment; **ETT** = **E**ducation/**T**echnology **T**ransfer

Year VII: July 1, 2004 – June 30, 2005

Seq. No.	Title	P.I.	Status
ETT168	GeoMo 2006: Shear Strength and Slope Stability	Stephenson	C/R
R167	Cyclic Load Testing and Acoustic Emission Methods of In-Situ Load Testing: Comparison and Development of Evaluation Criteria	Galati	C/R
R164	Assessment of the Bill Emerson Memorial Bridge Based on Seismic Instrumentation Data	Chen	C/R
R163	Structural Assessment of the I-70 Blanchette Bridge	Marianos	C/R
ETT162	Scholarships for Women and Minority Students Studying Engineering and Science	Elmore	C/R
R161	Geotechnical Site Characterization of Transportation Construction Sites and Structures	Anderson	C/R
ETT160	Incorporation of Hands-on Experiments in a Introductory Analysis Course	Belarbi	C/R
R159	Seismic Simulation and Design of Bridge Columns under Combined Actions, and Implications or System Response	Belarbi	OG
R158	Dependable Wireless Sensor Networks for Intelligent Infrastructures	Sedighsarvestani	C/R
R157	Analyzing Microscopic Behavior of Traffic Flow	Bham	OG
R156	Influence of Ore Physical Properties on the Transportable Moisture Limit for Barged Materials	Stephenson	C/R
R155	Field Testing of Soil-Foundation-Structure Interaction Under Explosive Load	Ge	C/R
R154	Stay-in-place (SIP) formwork for Rapid Construction of Corrosion-free Concrete Bridge Decks	Banks	C/R
ETT153	National Society of Black Engineers National Conference; NSBE Pre-College Initiative; Society of Hispanic Professional Engineers National Conference; MEP/SHPE High School Recruitment	Fransaw	C/R
ETT152	Minority Engineering and Science Program: Minority Intro to Technology and Engineering, Mathematics Engineering Science Achievement	Fransaw	C/R
ETT151	Women in Science and Engineering: Girls Lock-In Conference, Summer Solutions, Girls Camp, SWE National Conference Expanding your Horizons	Vogt	C/R
ETT150	6th International Conference on Case Histories in Geotechnical Engineering	Prakash	OG
R149	Travel Support to Establish the Center for Transportation Security (CTS)	Kiger	C/R
R148	Manufacturing and Performance Evaluation of Soy Protein Based Plastics and Composites Phase II	Chandrashekhara	C/R
ETT147	Summer Transportation Institute 2005	Yoest	C/R
R146	Geophysical Detection of Voids within the Levee, Duck Creek Conservation Area, Missouri	Anderson	C/R
ETT145	Geophysics 2006: Conference on Applied Geophysics	Anderson	C/R
R144	The Effect of Fatigue and Creep on Shear-Critical RC Beams Reinforced with CFRP Laminate Stirrups	Budek	C/R
R143	Development and Field Testing of an FRP Composite Bridge Deck with Guard Rail for Bridge 1480230, Greene County, MO	Myers	OG
R142	Experimental Evaluation of FRP Strengthening of Real Size Reinforced Concrete Columns	Galati	C/R

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R141	Remote Health Monitoring of Hillsborough County Bridges	Ayoub	C/R
ETT140	Minority Intro To Engineering (MITE), Mathematics Engineering Science Achievement (MESA)	Harris	C/R
ETT139	Girls Lock-In Conference; Summer Solutions 2005; SWE National & Regional Conferences	Elmore	C/R
ETT138	National Society of Black Engineers National Conference; National Society of Black Engineers Pre-College Initiative; MEP/SHPE Kansas City High School Recruitment Program; MEP Seven Week Summer Enrichment Program for Pre-college Freshmen	Huggans	C/R
ETT137	GeoMO 2005 Design of Retaining Walls	Stephenson	C/R
ETT136	Quality Geotechnical Testing Workshop and Short Course	Stephenson	C/R
R135	Strengthening of Rural Bridges Using Rapid-Installation FRP Technology	Bennish	C/R
R134	Manufacturing and Performance Evaluation of Soy Protein Based Plastics and Composites	Chandrashekhara	C/R
R133	Assessment of Bridge Technologies through Field Testing	Galati	C/R

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Year VI: July 1, 2003 – June 30, 2004

Seq. No.	Title	P.I.	Status
ETT132	Missouri Local Resource Center 2005	Qureshi	C/R
R131	Seismic Data Extraction of Cape Girardeau Bridge	Chen	C/R
R130	Validation and Calibration of Testing Equipment for In-Situ Load Tests	Galati	C/R
R129	Low Energy Alkali Resistant Iron Phosphate Glass Fibers	Brow	C/R
RE128	Monitoring of Bridge Structures Equipment	Galati	C/R
ETT127	Enhancing Student Awareness and Faculty Capabilities in Transportation	Schonberg	C/R
R126	Phase II of Evaluation and Utilization of the WP4	Petry	C/R
ETT125	University Student Design Competition Center (USDCC)	Stone	C/R
R124	In Situ Load Testing of Bridge A6358 and Bridge A6101	Nanni	C/R
R123	Evaluation of Anchors for CFRP Tendons	Soudki	C/R
R122	Design, Fabrication, and Testing of Low-Profile Composite Bypass Road Panel: Phase I	Nanni	C/R
ETT121	GEOMO 2004: Geotechnical Uncertainty and Reliability	Stephenson	C/R
R120	SASW/Study of Greater St. Louis and Surrounding Region	Anderson	C/R
R119	Preservation of MO Transport. Infrastructure: Flexural Upgrade of Deficient Bridges with Composites	Nanni	OG
R118	GPR Investigation of Bridge Deck, Willow Springs, MO	Anderson	C/R
R117	Determination of MASW Shear-wave Velocities at Various Sites in SE Missouri	Anderson	C/R
RE116	Acquisition of a Engineering Seismograph	Anderson	C/R
RE115	Acquisition of an Impact Testing Machine	K.C.	C/R
R114	Comprehensive Shear-Wave Velocity Study in the Popular Bluff Area, Southeast Missouri	Anderson	C/R
R113	GPR and Resistivity to Determine Depth to Bedrock at the Roaring River Hatchery	Anderson	C/R
R112	Strut Failures of Paseo Suspension Bridge in K.C. Missouri	Chen	C/R
R111	Finite Element Modeling of Reinforced Concrete Bridge Decks with ABAQUS	Ganesh	C/R
ETT110	Summer Transportation Institute 2004	Yoest	C/R
ETT109	League of United Latin American Citizens (LULAC), Kansas City H.S. Hispanic Recruitment, and Society of Hispanic Professional Engineers (SHPE) National Technical Career Conference	Harris	C/R
R108	Experimental Study on Seismic Retrofit Techniques Phase II	Silva	C/R
ETT107	GEOMO-1: 2003 Deep Foundations for Transportation Structures	Stephenson	C/R
ETT106	Girls Lock-In Conference, Summer Solutions 2004	Harris	C/R
ETT105	Minority Intro To Engineering (MITE), National Society of Black Engineers National Conference(NSBE), Mathematics Engineering Science Achievement (MESA)	Harris	C/R

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R104	GPR Study of imbedded Dowl Bars, Van Buren, Missouri	Anderson	C/R
R103	Southview Bridge Rehabilitation in Rolla	Nanni	C/R
ETT102	Geophysics 2004: Conference on Applied Geophysics	Anderson	C/R
R101	Soy-Based Composite Sandwich Structure	K.C.	C/R
R100	Determination of Shear Wave Velocity along a Segment of Interstate I-70, St. Louis	Anderson	C/R
ETT99	Missouri Local Resource Center 2004	Qureshi	C/R

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Year V: July 1, 2002 – June 30, 2003

Seq. No.	Title	P.I.	Status
R98	P.M.T.I. - Validation of FRP Composite Technology through Field Testing	A. Nanni	OG
R97	P.M.T.I.- Life-Cycle Inspection and Monitoring Using Near-Field Microwave NDT Methods	R. Zoughi	OG
R96	P.M.T.I. - Non-Destructive Testing of FRP Laminates	N. Maerz	OG
R95	P.M.T.I.- Materials and Durability	J. Myers	OG
R94	Development and Validation of SRP for Strengthening of Transportation Infrastructures	T. Ibell	C/R
R93	P.M.T.I.- Fiber Optic Monitoring	S. Watkins	OG
R92	A Study of the Effects of Injected Chemical Soil Stabilizers on Expansive Clays and Claystones	T. Petry	C/R
R91	Evaluation & Utilization of the WP4 Dewpoint Potentiometer	T. Petry	C/R
R90	Post-earthquake Damage Evaluation of Bridge Structures	G. Chen	C/R
R89	Experimental Study on Seismic Retrofit Techniques for Cap Beams, Columns and their Connections of Highway Bridges	G. Chen	C/R
ETT88	2003 USDOT Summer Transportation Institute	G. Spring	C/R
R87	Experimental Investigation of Bond-slip relationship between FRP bars and Concrete	G Thiagarajan	C/R
R86	Study on Seismic Retrofit Techniques for Cap Beams, Columns and their Connections of Highway Bridges	P. Silva	C/R
R85	Creep, Shrinkage and CTE Evaluation: Normal Strength Concrete Bridge Deck Companion Testing for an Adjacent HPC Bridge	J. Myers	C/R
ETT84	Expanding Your Horizons in Math, Science, and Technology; Girls Lock-In Conference; Summer Solutions 2003	M. Schoenborn	C/R
ETT83	Minority Introduction To Engineering and National Society of Black Engineers National Conference	F. Harris	C/R
R82	FRP Alignment Measurement Using Digital Image Analysis	N. Maerz	C/R
R81	Nondestructive Ultrasonic Detection of FRP De-lamination	N. Maerz	C/R
R80	Evaluation of Bridge Approach Slabs Performance and Design	R. Luna	C/R
R79	Optimization of HPC for Missouri Bridge Structures	J. Myers	C/R
R78	Soy-based Composite Sandwich Structures	Chandrashekhara	C/R
R77A	Micro-Macro Modeling of the External Strengthening of Concrete with FRP - Phase II	L. Dharani	C/R
R76	Study to Determine the Effects of Organics on the Results of Quicklime Slurry Treatment of Clay Soils	T. Petry	C/R
R75	GPR Investigation of Concrete Integrity, Shepard of the Hills Hatchery, Branson, MO.	N. Anderson	C/R
R74	Design and Installation of Torque Anchors for Tiebacks and Foundations	R. Stephenson	C/R

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Year IV: July 1, 2001 – June 30, 2002

Project Number [§]	Seq. No	Title	P.I.	Status
	R73	The Effects of a Curved Soffit on FRP-Strengthening of Concrete Bridges	T. Ibell	C/R
	R72	Determination of Shear-Wave Velocity Profiles from Surface Seismic Waves	N. Anderson	C/R
	RE71	Dynamic Testing Equipment	R. Stephenson	C/R
	ETT70	Missouri's Local Technical Assistance Program Center (LTAP)	M. Qureshi	C/R
	ETT69	Fifth International Conference on Case Histories in Geotechnical Engineering	S. Prakash	C/R
	RE68	Structures Laboratory Equipment Enhancement – Hydraulic Distribution System	R. LaBoube	C/R
	R67	Sappington Bridge Demolition, Crawford County, MO	J. Baird	C/R
	R66	Strengthening of Martin Springs Outer Road Bridge, Phelps County, MO	A. Nanni	C/R
	R65	Assessment and Rehabilitation of West 7th Street Bridge, City of Fulton, MO	A. Nanni	C/R
	R64	Rapid Strengthening of Reinforced Concrete Bridges	L. Bank	C/R
	R63	Joint KDOT-MODOT: Evaluation of FRP Repair Method for Cracked PC Bridge Members	A. Nanni	C/R
	ETT62	Transportation Research Board Student Technology Transfer	G. Spring	C/R
	ETT61	2002 Summer Transportation Institute	G. Spring	C/R
	R60	Highway/Rail Crossing Project Selection	M. Qureshi	C/R
	R59	Micro-Macro Modeling of the External Strengthening of Concrete with FRP	L. Dharani	C/R
	58	RETIRED NUMBER		
	RE55 A	Acquisition of an Integrated Testing System for Civil Infrastructure Engineering Research and Education	A. Belarbi	C/R
	R52	Steel-Free Hybrid Reinforcement System for Concrete Bridge Decks	A. Belarbi	C/R
	R37 A	Evaluating FRP Repair Method for Cracked PC Bridge Members Subjected to Repeated Loading	R. Peterman	C/R

[§] Project No. omitted from this reporting

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Year III: July 1, 2000 – June 30, 2001

Project Number	Seq. No	Title	P.I.	Status
R-5-38068	57	Implementation Issues of Metallic Dampers for Seismic Retrofit of Highway Bridges	G. Chen	C/R
R-5-38067	56	2001 Summer Transportation Institute	G. Spring	C/R
R-5-38069	55	Acquisition of an Integrated Testing System for Civil Infrastructure Engineering Research and Education	A. Belarbi	C/R
R-5-38065	54	Ground Penetrating Radar Evaluation of Contaminated Concrete Pavement	S. Cardimona	C/R
	53	RETIRED NUMBER		
R-5-38062	51	RETIRED NUMBER		
R-5-38061	50	Ground-Penetrating Radar/Seismic Study-Branson/Springfield, MO	N. Anderson	C/R
R-5-38060	49	Characterization of a New FRP Bar for Reinforcement of Concrete	J. Myers	C/R
R-5-38058	48	Doctoral Training in Civil Infrastructure Engineering	A. Belarbi	C/R
R-5-38051	47	Determination and Prioritization of MODOT Geotechnical Related Problems with Emphasis on Effectiveness of Designs for Bridge Approach Slabs and Pavement Edge Drains - Phase II	T. Petry	C/R
R-5-38050	46	Course Development for the Transportation Graduate Program at UMR	G. Spring	C/R
R-5-38049	45	Development of a Pull Tester	G. Galecki	C/R
R-5-38048	44	Automated Mobil Highway Sign Retro reflectivity Measurement	N. Maerz	C/R
R-5-38047	43	National Society of Black Engineers National Conference	F. Harris	C/R
R-5-38046	42	Laboratory and Field Testing of FRP Reinforced Concrete Bridge	S. Watkins	C/R
R-5-38045	41	Micro-Macro Modeling of the External Strengthening of Concrete with FRP	S. Roy	C/R
R-5-38044	40	USAES-UMR Cooperative Degree Program	N. Anderson	C/R
R-5-38043	39	High Performance Concrete for Bridge A6130 – Route 412 Pemiscot County, MO	J. Myers	C/R
R-5-38042	38	Acquisition of Asphalt Pavement Analyzer	D. Richardson	C/R
R-5-38059	37	Evaluating FRP Repair Method for Cracked PC Bridge Members Subjected to Repeated Loadings	R. Peterman	C/R

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Year II: July 1, 1999 – June 30, 2000

Project Number	Seq. No	Title	P.I.	Status
R-5-38041	36	Effect of Contaminants on Bond Characteristics of Deformed Reinforcing Bars	A. Belarbi	C/R
R-5-38040	35	Summer Transportation Institute 2000	G. Spring	C/R
R-5-38037	34	Non-Destructive Imaging of Shallow Sandstone in Support of Hydraulic Study of Litho Logic Unit	N. Anderson	C/R
R-5-38036	33	Non-Invasive Geophysical Investigation of Landfill Site: Grandview Triangle Area	N. Anderson	C/R
R-5-38035	32	Assessment/Mitigation of EQ. Hazards Along Designated Priority Emergency Vehicle Access Routes, SE MO.	N. Anderson	C/R
	31	RETIRED NUMBER		
	30	RETIRED NUMBER		
R-5-38029	29	CE 401 - Health Monitoring & Retrofit of Geotechnical Systems	R. Luna	C/R
R-5-38028	28	Composite Structures Using Asphalt Based Roofing Scrap Materials	Chandrashekhara	C/R
R-5-38027	27	Laboratory and Field Testing on FRP Composite Decks for the City of St. James, Phelps County, MO.	H. Nystrom	C/R
R-5-38024	26	Strengthening of an Impacted PC Girder on Bridge A10062, St. Louis County, MO	A. Nanni	C/R
R-5-38023	25	Structural Integrity Evaluation of RC Columns with FRP Wraps	A. Belarbi	C/R
R-5-38022	24	Model of Demonstration Bridge for Classroom and Laboratory Teaching	S. Watkins	C/R
R-5-38021	23	Determination and Prioritization of MODOT Geotechnical Related Problems w/Emphasis on Effectiveness of Designs for Bridge Approach Slabs and Pavement Edge Drains	T. Petry	C/R
R-5-38020	22	Investigation of Agents of Practical Use to Stabilize Slopes & Erosion Along the I-55 Corridor South of Sikeston	T. Petry	C/R
R-5-38019	21	Signal Mast Arm Failure Investigation	L. Dharani	C/R
R-5-38014	20	Development of a Prototype Imaging Concrete Roughness Measurement Device	N. Maerz	C/R
R-5-38025	13	The Influence of Surface Area to Volume Ratio on the Quality Control of High Performance Concrete	J. Myers	C/R

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Year I: July 1, 1998 – June 30, 1999

Project Number	Seq. No	Title	P.I.	Status
R-5-38015	19	Constructability and Performance of CFRP Prestressed Concrete Members	A. Nanni	C/R
R-5-38016	18	Strengthening of Bridge G270, Route 32, Iron County, MO	J. Myers	C/R
R-5-38011	17	1999 Summer Transportation Institute	G. Spring	C/R
R-5-38010	16	Web-Based Technology Transfer	Nystrom/Watkins	C/R
R-5-38017	15	Low Cost Renewable Resin for Pultruded Projects	Chandrashekhara	C/R
R-5-38018	14	Replacement Pedestrian Bridge at UMR	S Watkins	C/R
R-5-38013	12	PCI Girder Cracking Phase II: Causes and Design Detail	J. Myers	C/R
C-5-34301	11	Destructive and Non-Destructive Test of Bridge J857, Highway 72, Phelps County, MO	M. Barker	C/R
C-5-34300	10	Comparison of High Performance Steel and Conventional Steel Girder Bridges	M. Barker	C/R
C-5-34313	9	Cracking in Prestressed I-girder Bridges	V. Gopalaratnam	C/R
R-5-38005	8	UTC-Advanced Materials and Non-Destructive Test Technologies/Educator	S. Watkins	C/R
R-5-38004	7	UTC Center Evaluation – Self Assessment Process	H. Nystrom	C/R
R-5-38007	6	Feasibility Study: Concrete Roughness Measuring Device	N. Maerz	C/R
R-5-38012	5	Minority Introduction to Engineering	F. Harris	C/R
R-5-38006	4	Metallic Dampers for Seismic Design and Retrofit of Bridges	G. Chen	C/R
R-5-38001	3	Experimental Testing and Modeling of an FRP Box Culvert Bridge	Chandrashekhara	C/R
R-5-38002	2	Application of Ground Penetrating Radar to Highway Related Problems	N. Anderson	C/R
R-5-38003	1	Route Characterization & Geophysical Survey Feasibility Study of Previously Mined Ground Along Alternate “E” Proposal Highway 71 Bypass, Joplin, MO	N. Anderson	C/R

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