ACHIEVEMENTS OF PAVEMENT EVALUATION DIVISION

For 2011-2012

AND

Plan for 2012-2013
Area of Work

1. Pavement Performance Studies and Pavement Deterioration Modeling
2. Structural and Functional Evaluations of Highway Pavements
3. Pavement Maintenance Management System
4. Investigation of Causes of Pavement Distress / Failures and Needed Remedial Measures
5. Quality Audit / Quality Assurance / Quality Checking of Road Construction
6. Traffic and Axle Load Studies
7. Design of Flexible Pavements
8. Evaluation of New Construction Materials and Maintenance Technique
10. Strengthening/Rehabilitation of Flexible Pavements
11. Economic Analysis of Road Projects
12. Road Asset Management Related Aspects
13. Structural and Functional Evaluations of Airfield Pavements for Maintenance and Rehabilitation Needs
14. Applications of HDM-4 Tool for Different Purposes
Major Achievements During 2011-12

Papers Published:
• 9 (1 Journal & 8 International and National Conferences)
• One Communicated in I R C Journal

Number of Projects Handled:
• 11th Five Year Plan Project (SIP-030)
• SSP - 05, OLP - 02, CNP - 21, TSP - 15
PUBLICATIONS (2011-2012)


PUBLICATIONS (2011-2012)


Communicated

Sudesh Kumar, S P Pokhriyal, B M Sharma and Pradeep Kumar entitled “Significance of Pavement Surface Friction and Case studies” Accepted for Publication in IRC Journal
Major R & D Projects (2011-2012)
Objective

- DEVELOPMENT OF MANAGEMENT SYSTEM FOR MAINTENANCE PLANNING AND BUDGETING OF HIGH SPEED ROAD CORRIDORS

Scope

- Development of management system involving network of high speed road corridors Towards making logical decisions about the budget requirements and allocation of funds thereof for maintenance of pavements and bridges, based on optimal life cycle cost.

Outcome

The management system proposed to be developed would be capable of

- Estimating the budget requirements and allocation of funds for pavement maintenance in constraint and unconstrained budget scenarios.
- Deciding the optimal maintenance of road network within the given budget scenario.
- Carrying out distress diagnostics, performance evaluation and rehabilitation and retrofitting of bridges.
SUPRA INSTITUTIONAL PROJECT

Field Investigations on 56 selected Road Sections

1st series of performance observations on identified test sections completed.

Data management / Analysis for 1st series of observations completed.

Calibration of HDM-4 Pavement Deterioration Models is in progress.

Second series of performance observations, undertaken since November 2011 and is in progress. About 30% of field work has already been completed till March 2012. Further work is in progress.
Development of GIS Based National Highways Information System (SSP-4444)

Objectives
Development of National Highways Information System on GIS Platform

Scope
National Highway Except NHDP: 40,000 kms

Outcome
GIS Based National Highways Information System-Web Based Application
Benefits: GIS based National Highways Information System containing the information of the entire National Highway Network of India (except NHDP) on a common platform, enabling the system to interact with the user and in deciding maintenance strategies.

Users: MORTH, NHAI
Development of GIS Based National Highways Information System (SSP-4444)

P E D Role:
• Coordinated and Collected Road Inventory and Pavement Condition Data using Network Survey Vehicle

• Collected Secondary Data from Various National Highway Divisions/Departments

• Associated in Designing of Software by NIIT, Technologies

• Finalization of Data Format and Validation of Field Data before Submitting to MORTH
Studies on Performance Evaluation of Rigid Pavements Using Instrumentations on High Density Traffic Corridors (NH-2) in UP, Rajasthan and West Bengal (SSP – 4471)

**Objective:**
To validate and verify the actual relationship between various design parameters assumed in theoretical design and those as actually observed under the rigid pavement in actual use.

**Scope:**
To Study the Rigid Pavement Behavior Using Instrumentation at 8 locations on NHDP

**Outcome:**
The results of the study are proposed to be used for furthering the understanding of actual R P design considerations vis-à-vis incorporating modifications in the design methodology to be used in future.

**Users:**
MORTH, IRC, NHAI, NRRDA
OBJECTIVE
To evaluate the performance of road sections constructed with different types of bituminous surfacing by using fly ash as filler vis-a-vis bituminous surfacing constructed in a conventional way.

SCOPE OF WORK
- Pavement condition evaluation of road sections at Internal Roads in NTPC-Dadri plant and Internal Roads in NTPC-Badarpur plant, before construction; materials and construction specifications; preparation of BOQs, Job mix designs; and limited construction quality checking / supervision.
- Association during laying of demonstration stretches for use of fly ash in Bituminous Concrete (BC), Stone Matrix Asphalt (SMA) and Slurry Seal / Micro-Surfacing.
- To develop periodic pavement performance data (such as deflection, roughness, surface distress, traffic volume etc.) for a period of 3 years.
OUTCOME

• Study on the performance of identified test sections without and with fly ash (waste material as filler) laid on the internal roads of NTPC Dadri with various bituminous surfacing (BC and SDBC)
• Use of waste material such as fly ash as a filler in bituminous mixes
• Development of guidelines
• Reduction of natural resource i.e. stone dust, etc.

USER

• Thermal Plants
• Road Construction Departments
Applications of Rhinophalt Preservative and its Performance Evaluation on Three Toll Roads (Trial Stretches) in Rajasthan and Gujarat States (SSP – 4487)

Objectives

Performance Evaluation of Rhinophalt Preservative on the Three Toll Roads in Rajasthan and Gujarat

Scope

Performance studies will be undertaken periodically on three stretches for three years:

1) Visual condition survey
2) Benkelman Beam Deflection Survey
3) Roughness Survey
4) Traffic Volume and Axle load surveys
5) Test pit observation
6) Skid resistance
7) Laboratory Evaluation of cores
Outcome
Performance Evaluation of Rhinophalt Preservative on Three Toll Roads (Trial Stretches) in Rajasthan and Gujarat States.

User
IL & FS Transportation Networks Limited
MoRTH
NHAI
CPWD
State PWDs
Road Construction Agencies
Economic Benefits of Toll Roads in India
(CNP – 1419)

Objectives
Quantitative and qualitative assessment of economic benefits accrued from three Toll Road Projects in Gujarat & Maharashtra

Scope
Following activities undertaken on all the three roads:

• Benkelman Beam deflection studies
• Axle load surveys
• Visual surface condition assessment
• Roughness measurements
• Traffic volume surveys
• Traffic congestion studies
• Accident studies
• Data augmentation and analysis through HDM-IV
Outcome
Estimation of economic benefits like

- Vehicle Operation Cost (VOC)
- travel time savings and
- reduction in accident cost and
- reduction in congestion etc.

User
IL & FS Transportation Networks Limited
MoRTH
NHAI
CPWD
State PWDs
Road Construction Agencies
Detailed Investigations To determine the Probable Causes of Damage /Distress on Three Roads in Agra Circle and Suggest Remedial Measures (CNP-1726)

Objectives
To Determine the probable causes of distress/Damage and Suggest remedial Measures needed for improving the condition

Scope
Three Roads namely
1. Vrindavan-Mant Approach Road Via Dangoli
2. Kosi-Kamar-Kotwan Road
3. Raya-Mant Road

Outcome
• Probable causes of Distress/Damage and Remedial Measures

User
• UP PWD
Objectives
Development of National Guidelines on Use of Weigh-In-Motion System

Scope
Preparation of State-of-Art report on the WIM Technologies/System

Outcome
Development of National Guidelines on Use of Weigh-In-Motion System covering:
- appropriate technologies,
- operating procedures and methodologies,
- selection of weigh stations,
- typical specifications of WIM system,
- commissioning, installation and operationalisation of WIM system,
- hardware and software requirements,
- infrastructure facilities required at typical WIM station

Central Road Research Institute, New Delhi (Council of Scientific and Industrial Research), India
Design Construction and Performance Evaluation of New Materials and Mixes Towards development and Upgradation of Standards/Specifications (OLP-471)

**Objectives:** Design Construction and Performance Evaluation of New Materials and Mixes

**Scope:** Development of Specifications for hot mix asphalt using waste Plastic

**Outcome:** Based on the Study Results/Findings, Revision of Present Code of Practice IRC: SP:79-2008 (For SMA), IRC: SP: 81-2008

**User:** PWD, NDMC, NHAI etc. (Highway Professionals)
Involved in the Following Major Projects

• Quality Audit of Lucknow Muzzaffarpur National Highway Project (LMNHP) Works, 8 Packages
• Consultancy Services for Conducting Road Safety Audit for PPP Projects on DBFO Basis
• Performance Monitoring of Jute Pilot Projects Under PMGSY in the States of Assam, Odisha, Chattisgarh and Madhya Pradesh
• Evaluation and Performance of Star Seal Supreme
Shri K. Sitaramanjaneyulu

- “New Technologies Used for Road Construction” in Cochin Road Conclave held on 25.09.2011 organised by Corporation of Cochin
- “Flexible Pavement Design and Construction” for Training Programme for Siemen’s GTE’s – Civil at NTPC, Noida on 10.10.2011
- “Construction Supervision” during Bi-Annual SOsA / SAASO / CE(AF) Conference at Air Headquarters (Vayu Bhavan) on 1.12.2011
- “Quality Monitoring Processes in Construction of Roads” in India Roads Conference 2012 held on 15-16 Feb, 2012 organised by ASAPP Media Information Group, Mumbai
Presentations

Dr. Devesh Tiwari

• Visiting faculty on Highway Planning & Design Course at School of Planning and Architecture (SPA), Delhi for 2nd Semester Students for the Year 2011-12.


5. Mr. Deepak Boora, B. Tech (Civil Engineering), 3rd year, student of Indian Institute of Technology, Kharagpur on the topic “Road Inventory and Pavement Condition Survey using Automated Road Survey System” June 2011


7. Mr. Manish Mishra, Master of Computer Applications (MCA), Final year Student of Shri Ram Murti Smarak College of Engineering and Technology, Bareilly on the topic “Pavement Data Management System” July 2011
• Pavement and Bridge Management System

• Laboratory Work Related to Flexible and Rigid Pavement Evaluation
• International Course on Dissemination of HDM-4
• Pavement Evaluation Techniques and Their Applications for Maintenance and Rehabilitation
• In addition contributed in training programme organized by other divisions
Tailor Made Training Programmes

• “Customized Training Programme on Pavement Evaluation Techniques and their Applications for Maintenance and Rehabilitation”; Organized at Patna, Bihar for Engineers of Road Construction Department (RCD), Bihar during 30.06.2011 to 02.07.2011

• “Customized Training Programme on HDM-4”; Organized at Patna, Bihar for Engineers of Road Construction Department (RCD), Bihar during 19.12.2011 to 24.12.2011

• PMGSY Training programmes sponsored by NRRDA -04 Nos.

• UP Rural Engineering Services- 03 Nos.
Plan for 2012-2013
Ongoing R&D Activities

• Development of Management System for Maintenance Planning and Budgeting of High Speed Road Corridors

• Development of National Document /Guidelines on Use of Weigh-In-Motion (WIM) System in India for Axle Load Monitoring

• Design Construction and Performance Evaluation of New Materials and Mixes Towards development and Upgradation of Standards/ Specifications

• Performance Evaluation of Rhinophalt Preservative on Three Toll Roads (Trial Stretches) in Rajasthan and Gujarat States.
New R&D Activities Planned

• Development of Pavement Performance (experimental Road Sections) Data for a Period of Three Years to Study Strength, Deformation Response and to Back Calculate the Sub-grade Modulus (GAP Project Sponsored by DST in Collaboration with IISc, Bangalore)
• Development of Dynamic Modulus Master Curves for Indian Hot Asphalt Mixes
• Development of Data Base Management System (Software) for Management of Road Inventory and Pavement Condition Data
• Feasibility Study on the Use of Thermocole Waste in Bituminous Mixes
• Study on the Effect of Surface Texture of Bituminous and Cement Concrete pavements on Skid Resistance
• Comparative Study on Stone Matrix Asphalt Mixes by using Different Types of Fibers
• Study on Effect of Pavement Surfaces for Noise Reflection and Absorption
Participation in 12th Five Year Plan

• Development of Management System for Maintenance Planning and Budgeting of High Speed Road Corridors (Spillover of 11th Plan Work)

• Development of Indian Highway Capacity Manual

• Development and Application of Technologies for Sustainable Transportation

• Evaluation of Economic Loss Due to Idling of Vehicles at Signalized Intersection and Mitigation Measures
Major Consultancy Projects

• Road Inventorisation and Pavement Condition Survey on the Selected Road Stretches using Vehicle Mounted Digital Video System Integrated with GPS
  (Sponsored by M/s RITES, Limited, Gurgaon)
• Assessment of Orissa Road Network using Falling Weight Deflectometer and Automated Road Survey System
  (Sponsored by PWD, Odisha)
• Evaluation of Pavement Condition, Strengthening Requirements and Development of Database Management System for Delhi PWD Roads (Ring Road and Outer Ring Road)
  (Sponsored by PWD, Delhi)
• Quality Audit of Lucknow Muzzaffarpur National Highway Project (LMNHP) Works, 8 Packages (Sponsored by NHAI)
  Consultancy Services for Conducting Road Safety Audit for PPP Projects on DBFO Basis (Sponsored by NHAI)
Association with IRC & BIS

Indian Roads Congress
- Member Secretary H-6 committee on “Road Maintenance and Asset Management”
- Member of H-2 committee on “Flexible Pavement”
- Member of H-3 committee on “Rigid Pavement”
- Member of H-9 committee on “Composite Pavement”
- Member of H- G-4 committee on “Mechanization”

Bureau of Indian Standards
- Member of Stones Sectional Committee, CED 6
- Alternate Member of Automotive Braking and Steering Systems, Vehicle Testing and Performance Evaluation Sectional committee ,TED 4
Contributions in Development of New and Revision of IRC Documents

- Development of Guidelines for Asset Management
- Development of Guidelines for Pavement Preservation
- Guidelines on Use of Cold Mix Technology for Maintenance of Roads
- Revision of IRC-82:1982 - Code of Practice for Maintenance of Bituminous Surfaces of Highways
- Guidelines for Structural Strength Evaluation of Rigid Airfield / Concrete Pavements
- Guidelines for Overlays on Cement Concrete Pavements
Papers

• “Deterioration Modeling of Flexible Pavements with Modified Bitumen”, by Sanjay Deori, Dr. Rajan Choudhary, Dr. Devesh Tiwari, K. Sitaramanjaneyulu submitted for Third International Conference on Construction In Developing Countries (ICCIDC–III) (Advancing and Integrating Construction Education, Research & Practice), July 4-6, 2012 Bangkok, Thailand


Papers


Planned for Remaining Period

SCI – Two
International and National Conferences
Training Programmes (Planned)

• International Course on Dissemination of HDM-4

• Pavement Evaluation Techniques and Their Applications for Maintenance and Rehabilitation

• In addition
  – contribution in training programme organized by other divisions
  – Tailor Made Training Programmes
Association with PGRPE

- Pavement Evaluation
- Pavement and Bridge Management System
- Laboratory Work Related to Flexible and Rigid Pavement Evaluation
Infrastructure Facilities Developed During 2011-2012
Infrastructure Facilities Developed

1. Integrated System for Determining the Performance Characteristics of Asphalt Mixture

2. Weigh-In-Motion System

3. Upgradation of Automated Road Survey System with Pavement Imaging System
Integrated System for Determining the Performance Characteristics of Asphalt Mixture
DYNAMIC MODULUS AND FLOW NUMBER TESTS CONDUCTED WITH THE ASPHALT MIXTURE PERFORMANCE TESTER (AASHTO: TP 79-2009)
14 KN PNEUMATIC - UNIVERSAL TESTING MACHINE WITH PNEUMATIC CONTROL VALVES AND DIGITAL CONTROL TECHNOLOGY

• Integrated Multi-Axis Control System (IMACS) Digital Controller
• UTS Software with test modules for international and local standards
• Can work for wide range of paving materials
• Environmental Chamber
FATIGUE LIFE OF COMPACTED HMA SUBJECTED TO REPEATED FLEXURE BENDING (AASHTO:T 321-07)
DETERMINATION OF RESISTANCE OF BITUMINOUS MIXTURES TO PERMANENT DEFORMATION, CONFORMING TO BS EN 12697-25:2005 (METHODS A & B)

Test method A: Determining the Dynamic and Static creep characteristics of bituminous mixtures by means of an uniaxial cyclic compression test
Test method B: Determining the creep characteristics of bituminous mixtures by means of the triaxial cyclic compression test.
Weigh-In-Motion

WIM

• Versatile equipment to collect data on Axle loads of commercial vehicle on highways

• User friendly soft ware generates variety of reports like site summary, ESAL etc.
Upgradation of Automated Road Survey System

Pavement Imaging System

High Resolution Line Scan Cameras for Pavement Surface

Covers 3.5 m Lane Width Using Two Images
Infrastructure Facilities Planned (2012-2013)

1. Automated Gyratory Compactor
2. Automated Bituminous Mix Slicer
3. Viscometer
4. Ductility Machine
5. Wheel Tracking Machine
6. British Pendulum Tester
7. Software for
   • Mechanistic Analysis and Design of Pavement
   • Pavement Image Processing
12th Plan Activities
11th Five Year Plan Project  
(Spillover to 12th Plan)

Supra Institutional Project entitled “Development of Management System for Maintenance Planning and Budgeting of High Speed Road Corridors”

- Performance studies on study sections (Partial) (time-series performance observation no. 2)
- Performance studies on study sections (Partial) (time-series performance observation no. 3)
- Calibration of pavement deterioration models of HDM4
- Database management using DMIS
- Development of logical intervention criterion covering different types of maintenance/improvement treatments and schemes
- One time performance evaluation of entire high speed corridors
Contribution in 12th Five Year Plan Projects

Development and Application of Technologies for Sustainable Transportation (SUSTRANS)

1. Improved Materials, Mixes and Design Methods Towards achieving reduced pavement thickness (WP-11)
2. Development of technology for Superior PERforming Bituminous PAVements (SUPERPAVE) (WP-12)
3. Warm Mix Technology for Road Construction (WP-13)
4. Use of Reclaimed Asphalt Pavement (RAP) in Construction and Maintenance of Bituminous Roads (WP-14)
5. Advanced Public Transportation System Using ITS (WP-5)
6. Designing and Development of Desk Top driving Simulator (WP-6)
Development of Indian Highway Capacity Manual (Indo - HCM)

1. Roadway Capacity Estimation of Inter-Urban and Urban Freeways (WP-03)

2. Capacity Estimation of Pedestrian Facility (WP-07)
Evaluation of Economic Loss Due to Idling of Vehicles at Signalized Intersection and Mitigation Measures (ELSIM)

Estimation of Delays at Signalized Intersections (WP-01)

Development of Models between Fuel Loss and Emission (WP-06)
Human Resource Development

• Pursuing B.Tech. (Civil Engg.) at Jamia Milia Islamia (Mr. A. P. Singh-final year)

• Registered for Ph.D. at IIT, Roorkee in July 2012 (Mr. Pradeep Kumar)

• Applied for Registration to Ph.D. at Jamia Milia Islamia (Mr. A. K. Sagar- in process)

• Training in Auto CAD 2012 Software (Mrs Sarita Rastogi)
Thank you