

DR. VIRINDRA K. RAINA - RESUME' (CV)

Civil Engineering Expert - POLICY & DIRECTION

- Design, Construction, Rehabilitation, Contract & Construction Management, Training, Disputes & Claims Resolution, and Business Development.

Specialized in BRIDGES

Currently:

Technical Director at I.T.N.L. (I.L. & F.S. Group)
from Jan. 01, 2009

formerly:

Techl. Advisor to Govt. of Bahrain: 40 km. long Bahrain-Qatar Sea-Link Project (US\$ 5000 Million), and

Sr. Expert and Consultant to: the U.N. & the WORLD BANK

Present CONTACT:

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and rainavk@gmail.com**

PROFESSION :

Civil Engineering (Management, Construction, Design, Training, Contracts, Disputes & Claims Resolution)

PROFESSIONAL MEMBERSHIPS :

- **Member, Institution of Civil Engineers, London, UK (MICE)**
- **Chartered Engineer, London, UK (C.Eng.)**
- **Professional Engineer, Ontario, Canada (P.Eng.)**
- **Member, India Roads Congress, New Delhi, India (MIRC) - L M No. : 5546**
- **Member of various professional civil engineering committees dealing with drafting of codes of practice for design, construction and specifications. Previously : Member of Committees for fixing budget and management criteria for various works, reviewing technical books and papers, monitoring work of certain research projects and selection and recruitment of engineers**

KEY QUALIFICATIONS :

- **as Technical Director : ITNL (of IL&FS Group).... Conducting in-house Technical AUDIT of on-going Projects, TRAINING of Senior Engineers, imparting Technical DIRECTION in DESIGN / CONSTN./ QA and QC / and ADVISE in TENDERING and Business Development particularly overseas**
- **Technical Advisor to US (PWA), Min. of Works, Govt of Bahrain, and: BAHRAIN-QATAR CAUSEWAY (40km long sealink through the Arabian Gulf).**

- **well rounded** Consultant engineering experience – **15 ½ years** experience as a **Senior Expert and Consultant** to the **United Nations** and to the **World Bank**, **and 26 years** competitive practising professional experience with **International Consulting Engineers** in the **Private sector**, in **developed** as well as **developing** countries
- as **CONSULTANT** to the **African Development Bank** carried out the “**Evaluation of Bank Group Assistance to Transport Sector in Malawi**”
- **Operations Advisor (Bridge Engineering, Contract Management, Training in Design and Construction-Supervision) and Business Development in various countries - as an Independent Consultant.**
- **Established and managed** a fully-fledged **Consulting engineering practice** for ten years (1972 -1982) in various fields of civil engineering, covering bridges, industrial structures, buildings, aircraft hangars, chimneys, cooling towers, water tanks & towers, reservoirs, silos, port structures, etc.
- **Designed and supervised construction of over 100,000 lane-meters of CONCRETE BRIDGES** in different countries **on various types of foundations in different substrata conditions.** [Prestressed and reinforced concrete straight / skew / curved - continuous, semi-continuous and determinate decks (voided slabs, boxes, beams-and-slab), constructed segmentally, in-place or precast in-place / launched; on caisson / pile / open foundations].
- A **highly qualified and experienced practising professional civil engineer with sustained private sector experience, a Ph.D. from London University (Imperial College), Professional Memberships of two globally recognized Civil Engineering Institutions (Institution of Civil Engineers – London, UK, and Professional Engineers of Ontario, Toronto, Canada), a track record of relevant experience, skill and thorough understanding, corroborated by numerous Publications and authorship of 9 Books in the relevant fields.**

MAIN CAPACITY:

.CIVIL ENGINEERING DESIGN, CONSTRUCTION-SUPERVISION, REHABILITATION, DISPUTE-RESOLUTION (Consultants and Contractors works) & TRAINING OF HOST-COUNTRY-ENGINEERS

- **Policy-Design AND Executive-Direction** - civil engineering, including transportation, design and construction sectors)
- **Institution building** : establishing parameters, drafting Terms of Reference, managing Engineering (project preparation / procurement / implementation) and personnel, assistance in establishing **Roads Authority**
- **Contract-Management & Monitoring**

- **Procurement**, including review of Bidding Documents to the requirements of International Organizations (World Bank, United Nations, African Development Bank, European Union, etc.) : Consultant Services, Works Contracts
- **Construction Management**, including investigation of Construction Failures / Claims / Dispute Resolution / Solutions / Rehabilitation A N D
- **Project Appraisal and Review**
- Human Resource Management, Job Descriptions and requirements, selection and recruitment of higher-level engineers for design / construction / procurement; and **ENGINEER-Training**

PUBLICATIONS :

- **authored 9 practical reference-class books** in civil engineering (based on extensive professional experience in several countries). The **Titles** are :
 - **Field Manual for Highway and Bridge Engineers, 2009 (3rd Edition)**
 - **The World of Bridges ...2007**
 - **Concrete Bridges Handbook, 1999;**
 - **Analysis, Design and Economics (Concrete Bridges), 1994;**
 - **Inspection, Repair, Strengthening, Testing and Load Capacity Evaluation of Concrete Bridges, 1994;**
 - **Consultancy and Construction Agreements for Bridges, including Field Investigations, 1989;**
 - **Concrete for Construction – Facts and Practice, 1989;**
 - **Construction, Maintenance and Rehabilitation (Concrete Bridges), 1988; and**
 - **Construction & Contract Management Practices the Inside Story, 2010**

(Publishers : McGraw Hill, New York , Tata-McGraw Hill, SHROFF-Publishers: Bombay and Galgotia Publications, New Delhi).
- Numerous **Papers** and **Technical Advisories** (all included in the above 8 books) and **Operational Procedures** (on construction, design, rehabilitation and contract management & monitoring) for manpower training through specialist refresher courses, and Assessment of engineering services. A partial list of these Papers is given in **Annexure – 1.**

COUNTRY EXPERIENCE:

- | | |
|-------------------------------|-------------------------------------|
| i. Bahrain | x. Lesotho (Southern Africa) |
| ii. Bangladesh | xi. North Yemen |
| iii. Bhutan | xii. Saudi Arabia |
| iv. Bosnia Herzegovina | xiii. Serbia |
| v. Canada | xiv. Sri Lanka |
| vi. Croatia | xv. USA |
| vii. England | xvi. ex-Yugoslavia |
| viii. India | xvii. Zambia |
| ix. Iraq | |

EDUCATION:

- **Ph.D. (Civil Engineering)**, London University (*Imperial College*), London, England, 1966
- **Major field** : Concrete Structures and Technology
- **D.I.C. (Concrete Structures and Technology) Masters Degree, Imperial College, London, England, 1964**
- **B.Sc. (Civil and Municipal Engineering), Banaras University, India, 1961. Awarded two gold medals for merit, 1st Class 1st – broke the University record.**

OTHER TRAINING RECEIVED:

- | | |
|--|--|
| at : | in : |
| <ul style="list-style-type: none"> - Battersea College of Technology, London, UK - City University, London, UK - Regent St. Polytechnic London, UK | <ul style="list-style-type: none"> • Tall Buildings (Analysis and Design) • Bridge Decks (Transverse Load Distribution) • Soil Mechanics and Foundation Design • Structural Analysis • Construction Management • Contract Management |

TRAINING IMPARTED to SENIOR ENGINEERS in VARIOUS COUNTRIES:

- (areas of) Training, imparted In-house, are indicated in **Annexure – 2** and these cover :
- Construction and Contract Mangmnt. and Monitoring of major Civil Engineering Projects**
 - Transportation structures (Design, Construction and Rehabilitation)**
 - workman-like Highway 'Construction-Administration' covering Administration, Management and Monitoring**
 - adopting a workman-like 'Field-Handbook' approach to Projects**
 - Disputes and Claims Resolution**

AWARDS :

- **selected and Cited as the BEST Structural & Bridge Engineer 2010 AND delivered the S.B.Joshi Memorial LECTURE of the Year.**
- **Two gold Medals for merit at Engineering Graduation (1st class 1st), topped in the University**
- **Commonwealth Scholar, London University, London, UK**
- **Cited in the "Who is Who", India**
- **'Citation' for various Professional Papers**

EMPLOYMENT RECORD :

As a practising professional, so far :

- 15 ½ years with the **UNITED NATIONS** and the **WORLD BANK** as a **senior Expert and Consultant AND**
- nearly 26 years with International Consultants and **Advisor to Govts.**
 - (in 17 Countries)

• POSITION:

From Jan. 01, 2009

Technical Director : ITNL (of IL&FS Group) conducting in-house **Technical AUDIT** of on-going Projects, **TRAINING** of Senior Engineers, imparting **Technical DIRECTION** in **DESIGN / CONSTN./ QA and QC / and ADVISE** in **TENDERING** and **Business Development particularly overseas**

• POSITION:

Technical Advisor: to the **US (PWA)**, Govt of Bahrain; AND for the **BAHRAIN-QATAR 40km. Long Sealink** through the **ARABIAN GULF.**

• EMPLOYER

Ministry of Works & Housing,
P.O.Box 5, Manama, Bahrain

• PERIOD

Dec. 2003 to Nov. 2008

• BRIEF WORK SUMMARY

- Procurement Planning, Design, Investigations, Surveys, Route-location, Supervision, Quantities, Costing, Contract Documents, Construction & **Constr. Methods Appraisal**, and **Q.A. & Q.C.** and **TRAINING** of Engineers for **Capacity-building in-house.**
- Advise on Policy Matters, Disputes & Claims Resolution Objectives and Strategic Plans.
- **Training of Senior Engineers and Policy-makers in various aspects of Design, Construction and Maintenance & Rehabilitation of Bridges, and Contract, Contract Management and Procurement of Consultancy and Construction Services.**

• POSITION

Consultant

• EMPLOYER

African Development Bank, Ivory coast, West Africa

• PERIOD

June – Sept., 2002

• BRIEF WORK SUMMARY

carried out the **Evaluation of Bank Group's assistance to Transport Sector in MALAWI**, during the previous 25 years, covering Road, Rail, Lake and Air transportation modes.

• POSITION

Operations Advisor (Bridge Engineering, Contract and Procurement Management and Training in Design and Construction Supervision) and Business Development **in various countries**, as an **Independent Consultant**

Intercontinental Consultants and Technocrats Pvt. Ltd. (ICT), New Delhi

• PERIOD :

Apr. 1999 – Nov. 2003 (*whenever in India*)

BRIEF WORK SUMMARY :

Training in Procurement and in Bridge Design and Construction Supervision Engineers, Business Development in different countries, preparation of Technical Proposals, and mounting Technical Audits – on Projects in India, Ethiopia, Bangladesh and Mangolia.

• POSITION :

Technical Assistance Consultant - Contracts Manager

EMPLOYER :

WORLD BANK, Ministry of Works, **LESOTHO (Southern Africa)**

PERIOD :

Feb. 1997 – Feb. 1999 (2 years)

BRIEF WORK SUMMARY :

- Road Rehabilitation and Maintenance Project : responsible for **contract management and monitoring and procurement of consultancy services and works contracts, ENGINEER-Training and preparing manuals of operational systems and procedures** for the eventual use of **Roads Authority.**
- For establishing and managing a **Roads Authority**, examined issues such as :
 - **Purpose of Roads Authority (RA)**
 - **Mission of RA**
 - **Jurisdiction of RA**
 - **setting up a Road Board (RB)**
 - **setting up a Road Fund (RF)**
 - **setting up a Road Fund Board (RFBd.)**
 - **Format of RA**
 - **RA Staffing**
 - **RA HQ Organogram**
 - **Measures needed to expedite / streamline RA working**
 - **Handling redundant staff from parent Ministry**
 - **Rolling Corporate Plan of RA**
 - **Managerial accountability**
 - **Introducing sound business practices into RA's working**
 - **Financial Accounting System (RA – FAS)**
 - **Financial Statement**
 - **Cost Accounting System (RA – CAS)**
 - **Management Info Systems (MIS) for roads and bridges, i.e. Road Management System (RMS)**

- Key Indices for measuring “Performance” of RA
- Duties of ‘Planning Unit’ in RA
- **Procurement** procedures
- Developing domestic contractors for road maintenance
- Allocating funds from RF to various road agencies
- Some typical road maintenance costs (Southern Africa)
- Bodies that manage different types of roads & requirements

PERIOD :

Jun. 1993 – Aug. 1994

BRIEF WORK SUMMARY :

Delivered Lectures and completed the Book titled “*Inspection, Repair, Strengthening, Testing and Load Capacity Evaluation of Concrete Bridges*”.

• POSITION :

Consultant – Highways & Bridges

EMPLOYER :

WORLD BANK (New Delhi)

PERIOD :

Jul. 1995 – end of 1996, (multiple short terms)

BRIEF WORK SUMMARY :

- **Technical Audit, Contract and Procurement monitoring**, supervision-missions for ongoing works, **analysis and time framing of work programs, construction schedules and over-runs of Bank funded highway projects in India.**
- **Examining appropriateness of Design Consultants’ structural solutions (for optimization of Quantities and adequacy of construction techniques)**
- Adequacy of quality of construction supervision of CONSULTANT
- **Inspecting and examining for :**
 - Percentage ‘physical’ progress of work
 - Percentage ‘financial’ progress of work
 - Percentage time elapsed in construction
 - Catch-up construction programme for the balance works
 - Corresponding monthly cash flow projections
 - Identification of commitments of each participant with cut-off dates
 - Adequacy of the Contractor’s Resource Management Plan of his manpower, plant, material and its optimized in-flow
 - QA and QC checks and certification
 - Identifying critical issues and their resolution

• POSITION :

Chief : Special Tasks Unit

EMPLOYER :

UNITED NATIONS, New York for UNPROFOR in **Croatia, Bosnia - Herzegovina, Macedonia, Serbia, and Belgrade**

PERIOD :

Sep. 1994 – Jun. 1995

BRIEF WORK SUMMARY :

- **Detailed assessment of Engineering and Procurement** in the vast operations (of the UN’s Field Administration and Logistics Division) spread over 160,000 sq. km.; **recommendations for streamlining the operations and reducing costs of resources of manpower and materials (Confidential Report).**
- Authored a **global Systems Contract for Engineering Management Services for Field Missions**

• POSITION & EMPLOYER :

Self Employed, **India, USA, UK, Canada**

• POSITION :

UN Expert (grade L6 i.e. D-I : Step VII) and Team Leader of UN Team of Experts and **Consultant, UNDP and DESD** in **Saudi Arabia....UN Index # 180026**

EMPLOYER :

UNITED NATIONS, New York

PERIOD :

Jul. 1982 - May 1993 (11 years)

BRIEF WORK SUMMARY :

Worked on multi-billion dollar Highway Development and Rehabilitation Projects including bridges, tunnels and culverts in Saudi Arabia, covering :

- Coordinating work in the field of transportation/traffic studies and economic evaluation of highway networks, hydrological studies and investigations, structural design, construction and repair of highways, bridges and associated structures, geotechnical and foundation problems, materials and testing, slope stability and rock slide studies, and operation and evaluation of routine and preventive maintenance
- Prequalifications, Tenders, Evaluations, Contracts
- Programme and Liaison with Consultants, Contractors and Authorities
- Providing technical support for project proposals, designs and **Procurement**
- Planning, analysis, design, economics, detailing
- Maintenance and rehabilitation
- Manpower training of engineers
- Providing direct on-call expertise to the Ministry
- Investigation of structural failures
- Writing / reviewing consultancy / construction contract agreements
- Investigating and evaluating construction claims, dispute resolution
- Conducting technical audits of various projects in various countries, the mid term and end-of-term evaluation of on-going projects and appraisal of projects in pipeline (e.g. the UNDP funded Railway Project in India)
- Inspection, evaluation and rehabilitation of damages to the infrastructure on Sanna-Hudaida highway including about 70 bridges (1984) – Republic of Yemen (A major Rehabilitation Work in **Republic of Yemen**)
- Analysis of proposals for Institutional restructuring

- **Conducting professional interviews for selecting and recruiting the Resident Engineers, Bridge Engineers, Civil Engineers, Materials Engineers, etc., for various highway projects.**

BRIEF WORK SUMMARY :

Detailed design of prestressed concrete bridges, aircraft hangars and a launching girder, preliminary design and preparation of **tender bids for seven bridges, and construction supervision**

POSITION :

Chief Executive Consultant

EMPLOYER :

Gilcon Project Services Ltd., Consulting Engineers, New Delhi

PERIOD :

1972 – 1982 (10 years)

BRIEF WORK SUMMARY :

For works in **India, Zambia, Iraq**, etc.

Total engineering from reconnaissance and feasibility studies through detailed engineering and contract documentation to construction supervision, in the fields of *bridges, flyovers, aqueducts, water reservoirs, tanks, storage silos, industrial structures, cooling towers, chimneys, aircraft hangars and port structures.*

POSITION :

Senior Engineer - Design and Construction, London, UK and Toronto (Ontario, Canada)

EMPLOYER :

R. Travers Morgan and Partners and Harry Brompton and Partners, **Consulting Engineers, London, UK**, and Department of Highways of **Ontario, Toronto, Canada**

PERIOD :

1966 – 1972 (6 years)

BRIEF WORK SUMMARY :

Reconnaissance, site selection, field investigations, design, project estimating, detailed engineering, prequalification of bidders, tender bids, evaluations, negotiations, work-awards, construction supervision, quality control checks, diagnostic testing, load testing, contract disputes, evaluation of cost and time overruns, manpower training, initial taking-over and maintenance, and final taking-over of the facilities.

PERIOD :

1963 – 1966

Carried out post-graduate research and study for **Ph.D. and D.I.C. at Imperial College, London University, London, England.**

POSITION :

Design and Construction Engineer, **India**

EMPLOYER :

U.S. Dugal & Co., Engineers & Contractors, New Delhi

PERIOD :

1961 – 1963 (2 years)

Referees :

1. Mr. Shri G. Athavale
President
Athravale, Lystad & Associates,
Consulting Engineers,
8180 – Greensboro Drive
Suite 550, Mclean, VA – 22102
USA
Phone : +(703)-893-3104
e-mail : cyn1.green@alaenr.com, sathavale@alaenr.com
2. Mr. A.A. Witecki
Consulting Engineer / Advisor
36 – Palermo Court, Brampton
Ontario – L6Z 3E9, **CANADA**
Phone : +(905) – 846 – 8112

CERTIFICATION :

I, the undersigned, certify that to the best of my knowledge and belief, this biodata correctly describes my qualifications and my experience.

[Signature]

Dr. Virindra Kumar Raina

Date : _____

NOTE:

My 9th Book (FIELD MANUAL FOR HIGHWAY AND BRIDGE ENGINEERS) is a **BRIEFCASE-COMPANION, an **'on-call-compendium-teacher'**, for the Engineers engaged on major composite Transportation Projects and **'impromptu'** tells them (almost) **ALL the chain ACTIONS they must take** (... at **each level** of Engineering-decision-making from the sides of the SUPERVISING (ie the Consultant's) Team, the EXECUTING (ie the Contractor's) Team and the MANAGER's (ie the Client's) Team... **.and dwells at great length on CONTRACT MANAGEMENT SYSTEM, CONTRACT MONITORING PROCESS, PROCUREMENT, ETC.****

Annexure - 1

A PARTIAL LIST OF TECHNICAL PUBLICATIONS

.....some of these are included in my 9 books mentioned earlier :

1. **ESTIMATION OF LOAD CARRYING CAPACITY OF CONTINUOUS PRESTRESSED CONCRETE BEAMS** – ‘Consulting Engineer’, July 1967, London (Dr. V.K. Raina).
2. **DISTRIBUTION OF LONGITUDINAL HORIZONTAL FORCES AMONG BRIDGE SUPPORTS TAKING INTO ACCOUNT DEFORMATION OF BEARINGS, FLEXING OF PIERS AND ROTATION OF FOUNDATIONS** – 1st International Symposium on Concrete Bridge Design, American Concrete Institute, Special Publication 23, April 1967, Toronto (Dr. V.K. Raina and A.W. Witecki).
3. **LIMIT STATE DESIGN OF CONTINUOUS PRESTRESSED CONCRETE BEAMS** – ‘Seminar on Problems in Prestressing’ ING of IABSE (Zurich) – IRC, February 1970, Madras (Dr. V.K. Raina).
4. **TALL SLENDER BRIDGE SUPPORT ANALYSED BY SECOND ORDER THEORY** – ‘Journal of Madras Highways’ – Special Issue, 1970 (Dr. V.K. Raina).
5. **ELASTIC AND ULTIMATE DESIGN AGAINST DIAGONAL CRACKING IN PRESTRESSED CONCRETE MEMBERS UNDER COMBINED TORSION, FLEXURE AND SHEAR** – ‘Seminar on Problems in Prestressing’, ING of IABSE (Zurich) – IRC, February 1970, Madras (Dr. V.K. Raina).
6. **DESIGN AND CONSTRUCTION OF A WELDED STEEL AIRCRAFT HANGAR** – ‘Annual Bulletin ING of IABSE (Zurich) 1970 (Dr. V.K. Raina and G.S. Sawhney).
7. **VOLUME CHANGE EFFECT ON DISTRIBUTION OF HORIZONTAL FORCES AMONG SUPPORTS IN CURVED AND SKEWED CONCRETE BRIDGES** – ‘The Bridge and Structural Engineer’, ING of IABSE (Zurich), Vol. 2, No. 2, Dec. 1972 (Dr. V.K. Raina and A.W. Witecki).
8. **DESIGN AND CONSTRUCTION OF TWO BRIDGES IN DELHI** – ‘The Indian Concrete Journal’, November 1972 (Dr. V.K. Raina).
9. **TRANSVERSE ANALYSIS OF SOME TYPICAL PRESTRESSED CONCRETE BOX SECTION BRIDGE DECKS** – ‘The Indian Concrete Journal’, October, November, December, 1974 and in ‘The Bridge and Structural Engineer’, ING of IABSE (Zurich), Vol. 5, No. 2, June 1975 (Dr. V.K. Raina).
10. **TWO DECK CONSTRUCTION TECHNIQUES FOR CONTINUOUS PRESTRESSED CONCRETE BRIDGE DECK ON TALL SUPPORTS** – ‘The Indian Concrete Journal’, 1974 (Dr. V.K. Raina).
11. **R.C. SECTION SUBJECTED TO AXIAL THRUST AND ANY AXIS BENDING** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Sept. 1975 Vol. 5, No. 4 (Dr. V.K. Raina).
12. **ANALYSIS AND DESIGN OF SLENDER EXPOSED R.C. PILES** – ‘The Bridge & Structural Engineer’ ING of IABSE (Zurich) Dec. 1976 Vol. 6, No. 4 (Dr. V.K. Raina and M.A. Easwaran).
13. **TRANSVERSE ANALYSIS OF TWIN BOX DECK OF TAWI BRIDGE** – ‘The Bridge & Structural Engineer’ ING of IABSE (Zurich) Dec. 1978 Vol. 8, No. 4 (Dr. V.K. Raina and G.L. Varma).
14. **APPROPRIATE TECHNOLOGY FOR DEVELOPING COUNTRIES** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 13, No. 4, Dec. 1983 (Dr. V.K. Raina).
15. **TEMPERATURE STRESSES IN CONCRETE BRIDGE DECKS – SIMPLE DESIGN METHOD** – ‘The Bridge & Structural Engineer’ ING of IABSE (Zurich) Vol. 15, No. 4 (Dr. V.K. Raina).
16. **CONSTRUCTION MANAGEMENT FUNCTIONS AND BID STRATEGY** – ‘The Bridge & Structural Engineer’ ING of IABSE (Zurich) Vol. 15, No. 4, Dec. 1985 (Dr. V.K. Raina).
17. **BRIDGE ENGINEERING – SOME TOPICAL REFLECTIONS** – ‘Saudi Ministry of Communications Seminar at King Saud University, Riyadh, March 1986 (Dr. V.K. Raina).
18. **ECONOMICS AND QUANTITY TRENDS IN ALTERNATIVE BRIDGE STRUCTURE SCHEMES** – ‘The Bridge & Structural Engineer’ ING of IABSE (Zurich) Vol. 16, No. 4, Dec. 1986 (Dr. V.K. Raina).
19. **BRIDGE DECK CONSTRUCTION TECHNIQUES** – 3rd Middle East International Road Federation Conference, February 1987, Riyadh (Dr. V.K. Raina).
20. **BLUE-PRINT FOR GUIDING TECHNICAL DEVELOPMENT IN THE FIELD OF CIVIL ENGINEERING PUBLIC WORKS IN DEVELOPING COUNTRIES** – Special Publication, ING of IABSE (Zurich) March 1992 (Dr. V.K. Raina).
21. **ECONOMICS OF ALTERNATIVE BRIDGE STRUCTURE SCHEMES** **
22. **ASSUAGING DISTRESS IN STRUCTURAL CONCRETE** **
23. **CRACKING IN CONCRETE BRIDGE DECKS** **
24. **SOME IMPORTANT CONSTRUCTION CONSIDERATIONS** **
** Produced by Dr. V.K. Raina for the Saudi Ministry of Communications, Seminar, May 1989
25. **MAINTENANCE OF BRIDGES** – ‘Annual Bulletin’ of the ING of IABSE (Zurich), 1993 (Dr. V.K. Raina).
26. **ECONOMICS AND QUANTITY – TRENDS IN ALTERNATIVE CONCRETE BRIDGE STRUCTURE SCHEMES** – Journal of the Indian Roads Congress, New Delhi, October – November, 1992 (Dr. V.K. Raina).
27. **CONSULTANCY SERVICES FOR MAINTENANCE – MANAGEMENT SYSTEM FOR BRIDGES (SOME ASPECTS)** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 20, No. 4, Dec. 1990 (Dr. V.K. Raina).
28. **EFFECT OF LINEAR TRANSFORMATION OF TENDON – PROFILE ON ULTIMATE STRENGTH IN CONTINUOUS PRESTRESSED CONCRETE BEAMS** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 21, No. 4, Dec. 1991 (Dr. V.K. Raina).
29. **BEARINGS FOR BRIDGES** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 21, No. 4, Dec. 1991 (Dr. V.K. Raina).
30. **EXPANSION JOINTS FOR BRIDGES** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 21, No. 4, Dec. 1991 (Dr. V.K. Raina).
31. **BRIDGE PARAPETS** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 21, No. 4, Dec. 1991 (Dr. V.K. Raina).
32. **VIBRATION OF BRIDGE DECKS** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 22, No. 1, March 1992 (Dr. V.K. Raina).
33. **REPAIR AND STRENGTHENING OF CONCRETE STRUCTURES BY EXTERNALLY BONDED STEEL PLATES** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 17, No. 4, Dec. 1987 (Dr. V.K. Raina).
34. **MAINTENANCE OF BRIDGES** – ‘The Bridge & Structural Engineer’, ING of IABSE (Zurich) Vol. 23, No. 4, Dec. 1993 (Dr. V.K. Raina).
35. **ESTABLISHING AND MANAGING A ROADS AUTHORITY.... the AFRICAN perspective** – the Indian Roads Congress Session Jan. 2004.....Was also delivered as a Lecture at the NATIONAL HIGHWAYS AUTHORITY OF INDIA, New Delhi, (Dr. V.K. Raina).
36. **FAST-TRACK DESIGN AND CONSTRUCTION OF BRIDGES IN A MAJOR HIGHWAY PROJECT** – ‘The Souvenir Issue’.... Seminar on ‘Fast Track Construction of Bridges and Structures’, ING of IABSE (Zurich) and Road Construction Dept. (Bihar), Feb. 2001, and in the ‘Special Number of the Bridge & Structural Engineer’ ING of IABSE (Zurich), Dec. 2001 (Dr. V.K. Raina and K.K. Kapila).
37. **“TRAINING PLAN FOR INSTITUTIONAL STRENGTHENING” for rapid development of Roads in Africa and Asia** *** (Dr. V.K. Raina)
38. **“MANAGEMENT IDEAS” for rapid development of Roads in Africa and Asia** *** (Dr. V.K. Raina)
*** International Seminar on Sustainable Development in Road Transport, New Delhi (Nov. 2001), IRC - PIARC

Actual total number of Publications exceeds 74

Annexure – 2

AREAS OF TRAINING, IMPARTED IN-HOUSE

A. Concrete for Construction 'Facts and Practice'

1. Practical Concrete Mix Design and Grading of Aggregates
2. Batching, Mixing, Transporting, Placing, Vibrating and Finishing of Concrete
3. Control of Surface Evaporation, and its Importance
4. Construction Joints, Cold Joints and Movement Joints
5. Under-water concreting
6. Inspecting, Sampling and Testing for Structural Concrete
7. Curing and Protection of Concrete
8. Admixtures: *Retarders, Accelerators and Plasticisers*
9. Effects of the following on concrete :
 - *Mix proportions*
 - *W/C ratio*
 - *Curing and curing method*
 - *Cement content and cement type*
 - *Aggregate type*
 - *Admixtures*
 - *Thermal changes*
 - *Age at test*
 - *Construction practices*
 - *Type of compression specimen (cylinder or cube)*
 - *Form and size of test specimen*
 - *Moisture content at time of testing*
 - *End-bearing conditions*
 - *Rate of loading*
 - *Entrained air on freezing and thawing characteristics of concrete*
 - *Sulphate attack*
 - *Sewage water*
 - *Acids leaching by water*
 - *Rusting of steel*
 - *Aluminium, copper, lead and zinc*
 - *Carbonation*
 - *Reactive aggregates (alkali-aggregate reaction)*
 - *Efflorescence*
 - *Deleterious rocks / minerals in aggregates*
 - *Various other substances (and recommended protective treatments)*
10. Relations between various types of concrete-strengths
11. Causes of low rate of strength-gain
12. Cracking of Concrete
 - *In plastic stage*
 - *In hardening stage*
 - *In hardened stage*
13. Non-Destructive Tests
14. Thermal properties of concrete, heat-Resistance of concrete
15. Pumped Concrete
16. Crack-and Wound-repair in concrete

B. Bridges and Flyovers :

1. Development of Bridge-form
2. The Substructure
 - *Open-foundations*
 - *Pile foundations*
 - *Under-reamed pile foundations*
 - *Caisson foundations (well foundations)*
 - *Piers*
 - *Abutments*
3. Estimating 'Safe Bearing Capacity' of substrata for open-foundations, caissons and piles
4. Bridge Bearings
 - *Superstructure 'movements'*
 - *Development of Bearings*
 - *Types of bearings recommended for different span-lengths and support – flexibility conditions*
 - *Neoprene Bearings*
 - *Pot Bearings and PTFE*
 - *Spherical Bearings*
 - *Cylindrical Bearings*
 - *Concrete Bearings*
 - *Lessons from actual 'Distress' experiences*
5. The Superstructure
 - *Reinforced Vs. prestressed concrete superstructure*

- *Slab-type decks (solid / voided)*
 - *Beam – and – slab – type decks*
 - *Box – type decks*
 - *Economic spacing between Beams in a deck*
 - *Simply supported decks*
 - *Balanced cantilever decks*
 - *Continuous decks*
 - *Segmental deck-construction (cantilever construction)*
 - *Economics – various considerations*
6. Economics and Quantity Trends in *alternative* bridge-structure schemes
 7. Construction Techniques
 - *Substructures*
 - *Reinforced earth walls (for retaining walls, abutments)*
 - *Superstructures*
 - *Temporary structures*
 8. Construction Considerations
 - *Excavation and back-fill*
 - *Piles*
 - *Concrete and concreting in adverse weather conditions*
 - *Concrete exposed to sea-water (marine-conditions)*
 - *Shutters*
 - *Reinforcing steel*
 - *Assembly and alignment of steel-decks in composite-construction*
 - *Prestressed concrete*
 - *Epoxy bonding agents*
 - *Shotcrete*
 - *Load-testing a superstructure*
 - *Various possible problems*
 9. Bridge and Culvert Maintenance / Rehabilitation
 10. Inspection Guidance for Bridge/Culvert Components
 11. Live Loads on Bridges
 12. Expansion Joints for Bridges
 - *Sources of movements and loads at Expansion Joints*
 - *Functional requirement of Expansion Joints*
 - *Compression seals*
 - *Large-movement Expansion Joints*
 13. Parapets and Railings
 14. Pre-Tender Data Questionnaire
 15. 'Bridge-Distress' Reporting System

C. Workman-like Highway 'Construction-Administration' covering Administration, Management and Monitoring :

1. Construction Administration
2. Site staff
3. Construction Activities
4. **PROCUREMENT – systems and process**
5. Project Records and Diaries
6. Construction Files
7. Construction Schedule
8. Quality Assurance
9. Standard Forms for :
 - *Quality Assurance*
 - *Quality Measurement*
 - *Site Administration*

D. Adopting a workman-like 'Field-Handbook' approach for Highway Projects :

1. Administration
2. Site clearance
3. Earthworks
4. Drainage
5. Pavement
6. Structures
7. Finishes
8. Utilities
9. Day works
10. Maintenance

E. Contract Management and Monitoring :

1. Contract Management System
 - *Procurement and Contract Procedures*

- *Bidding Process*
- *Evaluation and Evaluation-Report Formats*

2. Checklists for :

- Bidding Process for ~
 - (a) *Construction Tenders under **Competitive Bidding***
 - (b) *Construction Tenders under **Direct-Bidding***
 - (c) *Consultancy Tenders*
 - (d) *Goods Tenders*
- Bid Opening of ~
 - (e) *Tenders for Construction and Consultants services*
- Bid Evaluation of ~
 - (f) *Construction Tenders*
 - (g) *Consultancy Tenders*
 - (h) *Goods Tenders*

3. Price *escalation* and how to pay for it
4. Interim Payment Invoice / Certificate (IPI/IPC)
5. Retention Money – deduction and refund of
6. Mobilization and Machinery Advances – payment and recovery of
7. Final Account of Contractor's work
8. Liquidity Damage, Compensation Events and Extension of Time
9. How to Prequalify Contractors
10. Procedures for awarding Consultancy Contracts – RFP, Technical Evaluation, Financial Evaluation, and Negotiation
11. Contract Monitoring *Process* and Monthly Progress Report
12. Monitoring the effects of 'Plant-Production-Rates' and 'Job-Efficiency-Factors' on Contract Management