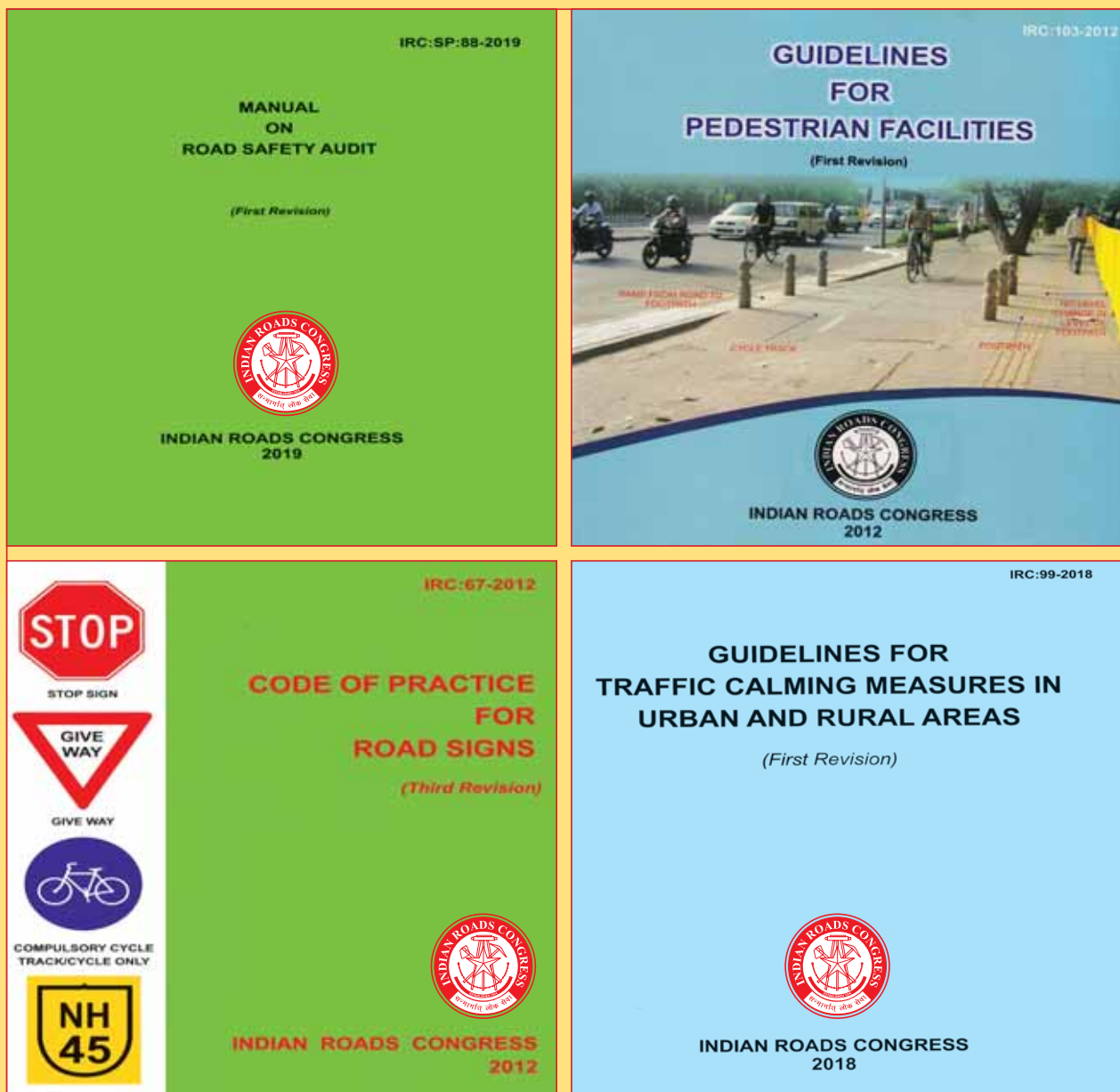




INDIAN HIGHWAYS

FEBRUARY, 2021

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National Road Safety Month-18th January to 17th February, 2021

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◀ Retro Reflectometer

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- Operates only when hand break of the vehicle is engaged
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- Onsite calibration
- 70-150kN with 7/9 Geophones



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CONTENTS

➤ From the Editor's Desk	4-5
➤ New/Revised Publications of IRC	6
➤ Advertisements	7-9 & 26
➤ Call for Paper/Advertisement Tariff	10
➤ IRC Technical Committees Meeting Schedule for February, 2021	26
Technical Papers	
➤ The Hangami Pool—A Case Study on Construction of Temporary Crossing Across Tapi River <i>By Ganesh S. Bhagure, Saurabh S. Tiwari</i>	11
➤ Analysis of the Reasons and Causes to Adopt PPP Model for Road Development with Special Reference to Maharashtra State <i>By Dr. M.N. Dekate</i>	16
➤ Role of Courts in the Implementation of Arbitration Awards and Reasons of Delays Thereof <i>By G.S. Mann</i>	24
➤ Potholes in Flexible Pavements <i>By P. M. Deshpande</i>	27
➤ MoRT&H Circulars	32-45
➤ Tender Notice	46

FEEDBACK

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ROAD SAFETY – NEED OF HOLISTIC APPROACH

In today's world, road and road transport has become an integral part of every human being. Everyone is a road user in one shape or the other. The present road transport system has minimized the distances but it has on the other hand increased the life risk. The fast-growing population, exceptional rate of motorization coupled with the ever-growing urbanization have made people vulnerable to frequent road accidents resulting in fatalities, injuries/disabilities.

As per Global Status report on Road Safety 2018 more than 1.35 million peoples globally killed every year and about 90% of these casualties are taking place in the developing countries. India ranks first in the number of road accident deaths across the 199 countries and accounts for almost 11% of the accident-related deaths in the World. As per Road accident report, 2019, in our country total of 1,51,113 people died and 4,51,361 people got injured in 4,49,002 number of road accidents during 2019. This causes immense economic hardship and emotional trauma not only to their families but also to the nations as a whole.

Accident reduction and accident prevention are the two main strategies in planning for road safety. In accident reduction, we use the knowledge of accidents that have occurred on our existing roads to improve the design of the roads or to influence the behaviour of road users, so that similar accidents do not occur again. So, there is need that all drivers should thoroughly check their vehicles daily before start of any trip and if any issue is found it has to be rectified immediately. Everyone should strictly follow the traffic rules and should always drive safely with respecting the other people and vehicles on the road. One must avoid rash driving, drunken driving and jumping red lights. Wearing helmets and seat belts could highly reduce the number of casualties during an accident. In addition, road safety measures should be added in the school curriculum so that students can get complete knowledge on traffic regulation. Most of the road accidents occur because of incomplete knowledge about operating vehicles and lack of road safety measures.

We all know that Road Safety is very vast subject and needs multi-pronged strategies across various pillars of road safety (i) Education; (ii) Enforcement; (iii) Engineering; and (iv) Environment. Road Safety is an integral part of engineering design at the Project Planning stage, DPR preparation stage, design stage and executing stage. There is need that all roads should be designed for the safety of all road users. This means ensuring adequate facilities for pedestrians, cyclists and motorcyclists. Measures such as footpaths, cycling lanes, safe crossing points and traffic calming measures, signage, markings, etc are important to reducing the risk of injury among these road users. All road designs should be a compromise between the ideal and the reasonable outcome in terms of cost, safety, service life, environmental and social issues. Major emphasis needs to be given on the road safety aspects on our roads. Another immediate requirement is to segregate the non-motorized form of transport by providing adequate facilities for them. Strategies have to be devised for conducting safety audits of roads, collection & collation of accident data and organizing awareness programmes.

On Engineering front IRC has been advising both Centre and State Governments for Design, Construction, Maintenance, Traffic Operation and issues related to the development and maintenance of Roads in the Country through publication of Technical Documents for the last 86 years. In last couple of year numerous new/ revised documents on road safety have been published by IRC viz Road Safety Audit Manual (IRC:88-2019); Traffic Calming Measure (IRC:99-2018); Road Signage (IRC:67); Road Marking (IRC:35); Crash Barriers (IRC:119), Pedestrians Facilities (IRC:103), Parking Facilities (IRC: SP:12); Cycle Tracks (IRC:11), etc for adoption by road user agencies and highway professionals.

In addition to design, construction of any road/road projects, road safety audit is very essential for improvement of road safety and prevention of accidents at all stage i.e planning, design, construction, maintenance & operation. Last year 2019 IRC has brought out a first revision of very comprehensive document on 'Road Safety Audit Manual' numbered IRC:SP:88-2019 for the guidance of Engineers and policy makers. It outlines the best practices to be followed in the field at the planning, design, construction, operation stages so as to minimize the chances of accidents. This Manual also provides procedures for applying quality assurance to road projects, from the standpoint of road safety. As per directions of Hon'ble Supreme Court Committee on Road Safety it is mandatory to conduct road safety audit including the design stage audit out for all road capacity augmentation projects of 5 km or more.

Till December, 2019 training/skill enhancement on 'Road Safety & Road Safety Auditors' to highways engineers was imparted by training institutions like IAHE, CRRI, IITs, etc on individual basis with varying curriculum. Prelude to this India IRC has taken lead for finalization of curriculum for training of Road Safety & Safety Audit and also for granting accreditation to Road safety Auditor. As a result, IRC formulated a curriculum for 15 days training course on 'Road Safety Audit' at par with best international standards for imparting to highway engineers and auditors with aim to maintain uniformity in the country. Subsequently, the Memorandum of Understanding for Imparting Training on Road Safety and Safety Audit was signed between MoRTH & IRC with 11 organizations i.e 4 IITs (IIT Roorkee, IIT Jammu, IIT Delhi, IIT Guwahati), 3 Training/Research Institutes (IAHE, Noida, NATPAC, Kerala, CSIR-CRRI, New Delhi) & 4 NITs (VNIT, Nagpur, SVNIT, Surat, MANIT, Bhopal, MNIT, Jaipur). IRC has also got positive response from remaining IITs and NITs for signing the MoU for imparting 15 days training on Road Safety and Safety Audit.

The Ministry is also working on implementing the Integrated Road Accidents (IRAD) Project under World Bank Assistance to provide a systemic solution to problem of accidents in line with international practice. Basically, the IRAD will enable capture of road accidents and geotagging of the same through a tablet provided to the first responder which is the police. The software of the project would provide back end analytics, as well as simultaneous linkage with multiple users (as in Hospitals, Ambulance, Blood Banks, Vahan, Sarathi, NHAI, PWD, Courts, Insurance Companies etc.), near real time syncing and updation of data base as well as development of a mobile application for Road accidents.

However, Road Safety cannot be the responsibility of Government alone. The commercial sector, service organizations, Non-Governmental Organisations (NGOs), academic institutions, play an important role in increasing road safety awareness. NGOs have an important input at grass roots level. Road works departments, both at central and state level has been taking a number of enabling steps for spreading road safety culture in the country. These include programmes on road safety training, education, driving instructions, traffic regulations awareness and improvement of both active and passive vehicle safety features. This year Ministry of Road Transport & Highways decided to observe Road Safety Month (instead of week) starting from 18 January to 17 February, 2021. Hope this month long programmes being organised throughout the country will generate more awareness and impact in road users in promoting road safety.



(Sanjay Kumar Nirmal)
Secretary General, IRC &
Additional Director General, MoRT&H

New/Revised Publications of IRC

The IRC has brought out the following 26 New/Revised Publications. These prestigious publications will be quite useful to the Highway Professionals. In order to give a face lift to our prestigious publications, most of these publications have been printed in 4-colour with high quality paper and workmanship.

S. No.	Title of the Document	Price	Packing & Postage
1	IRC:52-2019 Guidelines for the Alignment Survey and Geometric Design of Hill Roads (Third Revision)	600.00	30.00
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13	IRC:SP:87-2019 Manual of Specifications & Standards for Six Laning of Highways (Second Revision)	1500.00	60.00
14	IRC:SP:88-2019 Manual on Road Safety Audit (First Revision)	1400.00	40.00
15	IRC:SP:91-2019 Guidelines for Road Tunnels (First Revision)	800.00	40.00
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24	MORT&H Pocketbook for Highway Engineers, 2019 (Third Revision)	1400.00	30.00
25	MORT&H Standard Data Book for Analysis of Rates, Volume-I: For Plain/Rolling Terrain (Second Revision-2019)	1500.00	70.00
26	MORT&H Standard Data Book for Analysis of Rates, Volume-II: For Hilly Terrain (Second Revision-2019)	1500.00	70.00

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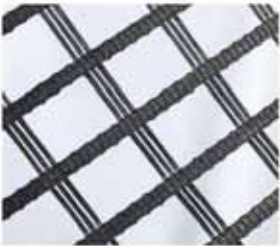


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THE HANGAMI POOL–A CASE STUDY ON CONSTRUCTION OF TEMPORARY CROSSING ACROSS TAPI RIVER



GANESH S. BHAGURE¹



SAURABH S. TIWARI²

ABSTRACT

Public Works Department (PWD) is very well known for their uniqueness in every project and stipulated time completion. Tapi River is the major waterway of Maharashtra and Madhya Pradesh States. Its flow carries sand, gravel and pebbles as bed material; also covered by black cotton soil and rock is found at greater depth which necessities more cost for construction of permanent bridge. That's the reason why temporary bridges are constructed and maintained every year from ancient days based on British government ideology.

The Hangami Pool is a temporary crossing constructed across Tapi River for connecting near by villages to the financial market of Jalgaon district. The structure has a 4.5 m wide carriageway having total bridge length of 230 m built by using gunny bag concrete, wooden bearing, steel girders and wooden sleepers. Due to this crossing transportation length is reduced directly from 60 km to 5 km which benefits around 50 villages situated on the riverbank. This structure is constructed every year in December maintained till May end and dismantled in June.

This paper explores the case study of construction of 15 span temporary bridges that is being constructed every year for road traffic by Public Works Department across Tapi River near Bhokar Village, Jalgaon district of Maharashtra state.

1. BACKGROUND

A bridge is a structure built to span a physical obstacle, such as a water body, valley or road, without closing the way underneath also connects two souls. Hangami Pool is located on Tapi River at km 14/500 on Chopada Khedi Bhokar Amoda Kanalda Jalgaon road SH-40 i.e. 40 Km from Jalgaon district (Fig.1). In Marathi Hangami

means seasonal and Pool means Bridge therefore local nomenclature for the bridge is 'Hangami Pool'. This bridge is constructed for temporary and short time communication of peoples, which is constructed after Monsoon i.e. in December maintained up to May and dismantled in June i.e. before monsoon by PWD (Public Works Department), Government of Maharashtra.

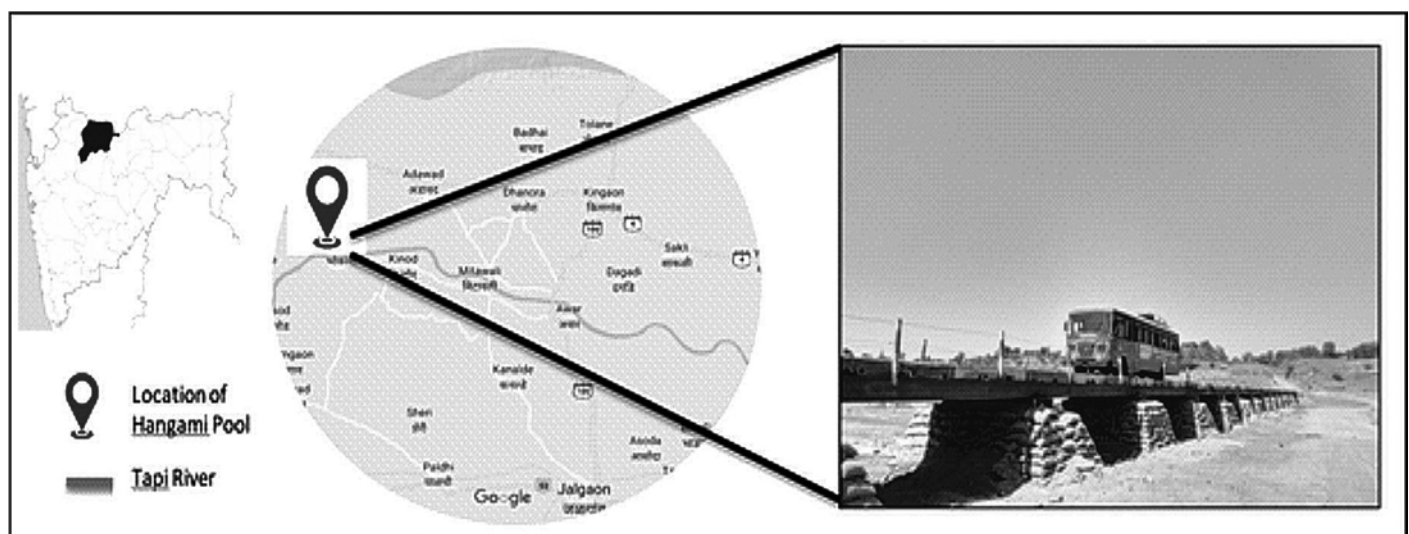


Fig.1 Location Map

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} Public Works Department, Govt. of Maharashtra, Jalgaon.

TECHNICAL PAPER

The Hangami Pool (**Photo 1**) construction technique is based on British government ideology as this bridge was constructed before independence at Vidgaon village which is 30 km from present location. After the construction of permanent bridge the same temporary one was shifted to Bhokar Village for fulfillment of the needs of local residents from last 25 years. It reduces the transportation length of 60 km to 5 km which benefits around 50 villages situated on the bank.

Tapi River is the major river flowing through Maharashtra and Madhya Pradesh, having a multi-channel river system having a high braiding tendency. The nature and behavior of Tapi is quite different. Its Flow carries sand, pebbles and gravel as bed material & also covered by black cotton soil so rock is found at greater depth which creates difficulty for the successful constructions demands prolonged duration which affect the needs of public adversely and

high initial construction cost. The average flood discharge of Tapi River is 489 Cum/sec with a seasonal average discharge of 50 Cum/sec in December to May maintaining a width of 500 m to 1000 m.

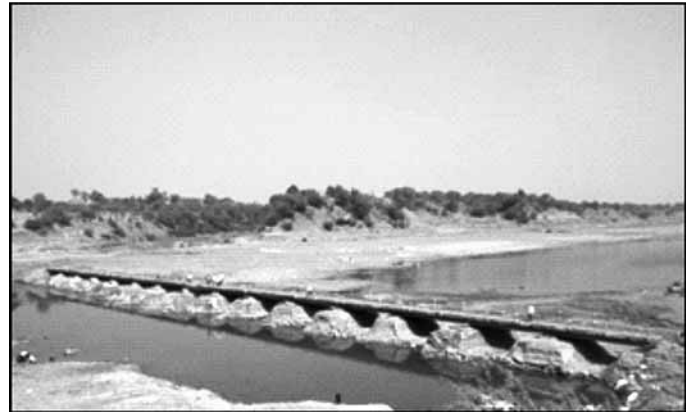


Photo 1. Hangami Pool across Tapi River

2. SALIENT FEATURES OF THE BRIDGE

Table -1 Salient Features of the Bridge

SR. NO.	DESCRIPTION	DETAILS
1.	Location	Chainage Km 14/500 on Chopada Khedi Bhokar Amoda Kanalda Jalgaon Road SH-40, Tal. & Dist. Jalgaon (40 Km from Jalgaon)
2.	Name of River	Tapi River
3.	Discharge	489 Cum/sec (Average Discharge) (During season 50 Cum/sec)
4.	Length of bridge	230m Multi span steel girder bridge
5.	Span arrangement	15 span of 9.33 m each plus abutments and approach road of 90 m
6.	Width of bridge	Carriage way of 4.50 m
7.	Width of approaching road	10m wide BT road recently constructed in Hybrid Annuity Model
8.	Total number of piers	14 piers plus 02 abutments
9.	Type of foundation	Open foundation resting on river bed
10.	Size of piers	4.50 m x 2.50 m having average height of 2.5 m
11.	Grade of concrete (a) Foundation pier & abutment (b) Bed block	1:6:12 gravel/pebble concrete in jute bags for piers and abutments M20 grade in-situ concrete
12.	Size of bed block over abutment and piers	4.50 m x 2.00 m x 0.20 m
13.	Size of wooden support bearing	4.50 m x 0.30 m x 0.30 m (03 for each pier and 02 for each abutment)
14.	Size of steel frame structure (a) Main girder (b) Cross girder	ISHB 450 ISHB 225 (05 main & 08 cross girder for each span)
15.	Type of wooden Material	Jungle Wood (Babul and Neem) having density 835Kg/m ³ Static Bending Strength 487 Kg/cm ² Compressive Strength 260 Kg/cm ²

TECHNICAL PAPER

SR. NO.	DESCRIPTION	DETAILS
16.	Size of wooden sleepers (a) 3.90 m long (b) 3.60 m long (c) 1.80 m long	3.90 m x 0.20 m x 0.10 m – 08 Nos 3.60 m x 0.20 m x 0.10 m – 07 Nos 1.80 m x 0.20 m x 0.10 m – 56 Nos (for each span)
17.	Size of wooden kerbing	3.10 m x 0.30 m x 0.15 m – 06 Nos (for each span)
18.	Size of wooden railing pole	1.00 m x 0.10 m x 0.1 m – 10+10 Nos (for each span)
19.	20 mm thick bituminous carpet with liquid seal coat	02 strips of 0.60 m wide over wooden sleepers
20.	Composition of river bed material	Sand, pebble & gravel mix
21.	Founding RLs (a) Piers (b) Abutment	122.00 m 122.20 m
22.	High flood level	142.95 m
23.	Low water level	123.40 m
24.	Deck level of the bridge	124.50 m
25.	Completion cost of bridge	Approx. Rs. 50 Lacs
26.	Periods (a) Date of work commencement (b) Date of work completion (c) Date of open for traffic (d) Date of end (e) Maintenance (f) Dismantling	10 December 31 December 01 January 31 May 01 January to 31 May 01 June to 07 June (Every year)

3. CONSTRUCTION IDEOLOGY

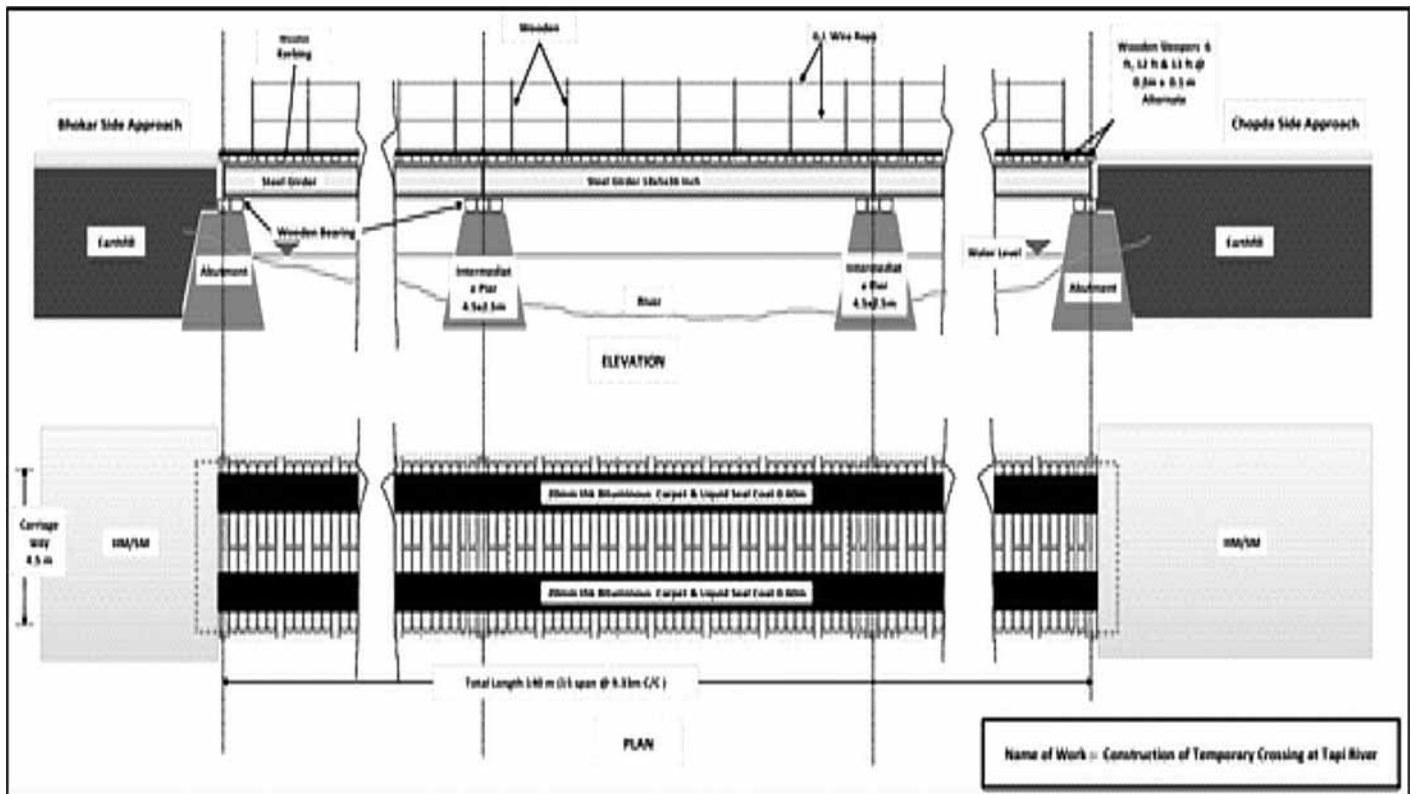


Fig. 2 General Arrangement Drawing

3.1 Fig. 2 shows the general arrangement of Hangami Pool having 15 spans of 9.33 m each with carriageway of 4.50 m. Basically foundations are designed to retain dead load, moving vehicle load and water current forces. Total width at crossing is 230 m clear bridge length of 140 m and approaches of 90 m are constructed by laying and compacting hard murum having WBM top surface with approaching BT roadway of 10 m width which was recently constructed under Hybrid Annuity Model (HAM).

3.2 Foundation

Foundation of this bridge is directly resting on bed surface of river. The main bridge has 14 piers and 02 abutments, from ancient days foundation was constructed by using gravel/pebbles concrete having mix proportion 1:6:12 filled in jute bag at shore and then transported to site by using boats. Now a day filled bag are transported site by mechanical means and arranged by breaking the continuity in the shape of a trapezoid; size of each trapezoidal pier is 4.50 m x 2.50 m with average height of 2.50 m, each pier requires 800 numbers of jute bag concrete as shown in **Photo 2**.



Photo 2 Construction of Piers and Abutments

3.3 Bed Block

The solid concrete above the piers/abutments of even finished bed surface were designed to accommodate three wooden bearings on each pier and two bearings on each abutment having size 4.50 m x 2.00 m x 0.20 m thick is laid after the construction of piers and abutments (**Photo 3**).

The main purpose of bed block is to hold the bearings in proper position and transmit the load of superstructure to the substructure safely.

3.4 Wooden Bearing

4.5m long wooden bearings having cross section 0.30 m x 0.30 m allocated in bed block for absorbing the shocks emerging from horizontal movements due to vehicular breaks restricting the vertical deflections and transferring superstructure load to the substructure.

3.5 Steel Frame Girders and Wooden Sleepers

The 9.33 m long five ISHB 450 are placed at distance of one meter as main girders and are kept in position by using four ISHB 225 on each side as cross girders; installed by mechanical means over wooden bearings (**Photo.4 a-b**)



Photo 3 Bed-Block and Wooden Bearing over Piers and Abutments



Photo 4-a

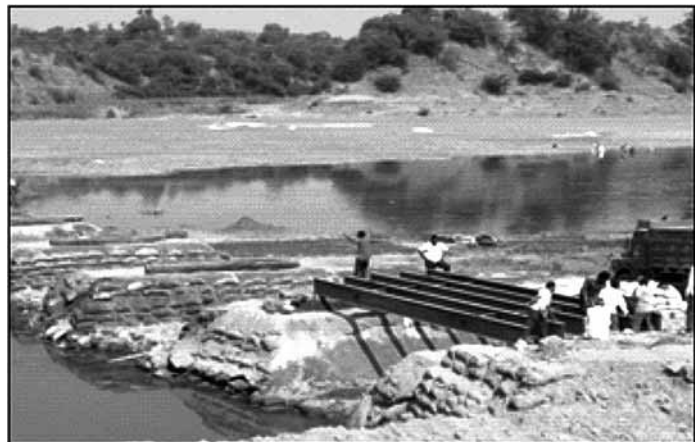


Photo 4-b

Photo 4 (a-b) Installation of Steel Fame Girders over Wooden Bearings

After installation of steel girders different sizes viz. 13 ft, (3.96 m) 12 ft (3.67 m) and 6 ft (1.828 m) long wooden sleepers laid over girders in alternate manner. Holding of wooden sleepers is done by providing and fixing 3.10 m x 0.30 m x 0.15 m size wooden kerbing as shown in (Photo 5 a – b).



Photo 5-a

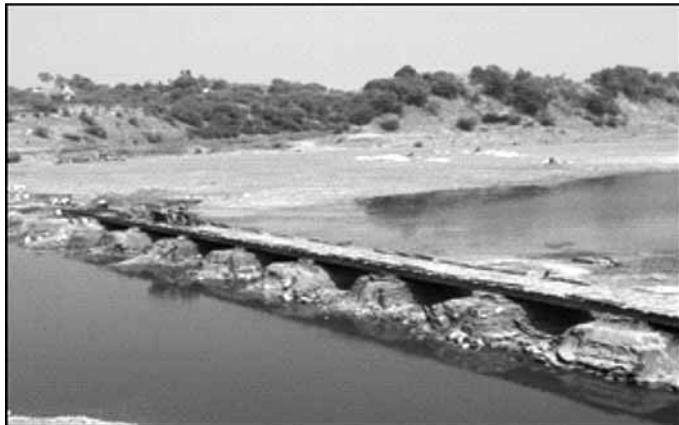


Photo 5-b

Fig.5 (a-b) Laying of wooden Sleepers over Steel Frame Girders



Photo 6 Preparation of Road Surface by Providing and Laying 20mm Thick Open Graded Premix Concrete with Liquid seal over Wooden Sleepers

3.6 Pathway

For providing carriage way to vehicular movement over

wooden sleepers; pathway is constructed by using 20 mm thick open graded bituminous carpet with liquid seal coat in two strips of 0.60 m wide as shown in Photo 6 Kerbing is also provided for holding the wooden sleepers in proper position.

For guiding the vehicles one meter height wooden railing pole are placed on both sides connected by using steel wire rope. Approach road was prepared using hard murum; watering and compaction are done for reducing the dust. Two watchmen are posted for controlling the vehicles and maintenance work in day and night shifts. Photo 7 shows routine vehicle movement on Hangami Pool.

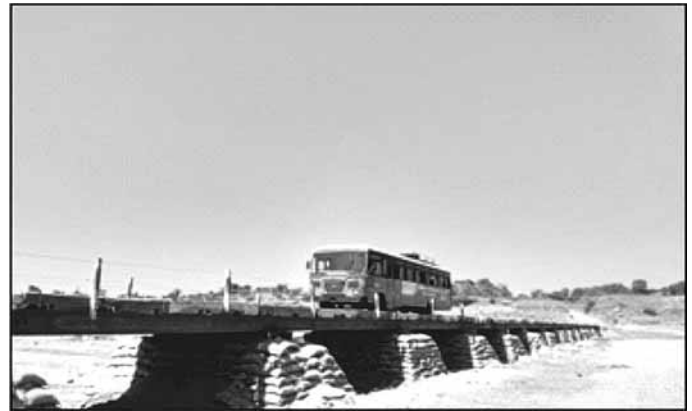


Photo 7 State Transport Bus Vehicle Moving on Bridge

4. CONCLUSION

50 nearby villages get access to financial market of Jalgaon and get benefited from all point of view; with low initial construction costs state PWD effectively repeatedly uses previous years materials for subsequent year's construction minimum maintenance cost and accelerated bridge construction method this structure stands firm with needs of the public which is always the centre of attention for PWD. Hence this unique construction ideology should be incorporated in type plan by making some modifications so that this can be effectively implemented wherever the temporary crossing is essential.

5. FUTURE SCOPE

There is future refinement needed in piers sizes, materials and construction methodology by involving modern techniques.

6. ACKNOWLEDGEMENT

The authors would like to thank Superintending Engineer, PW Circle, Jalgaon and Executive Engineer, PW Division, Jalgaon for their valuable guidance and wonderful supports. Authors also grateful to the whole team of PWD, Jalgaon.

ANALYSIS OF THE REASONS AND CAUSES TO ADOPT PPP MODEL FOR ROAD DEVELOPMENT WITH SPECIAL REFERENCE TO MAHARASHTRA STATE



DR. M.N. DEKATE¹

ABSTRACT

Maharashtra state is bestowed with areas varying in geological and climatic conditions spreading over 3,08,000 sq km. The state possesses the most advanced urban conglomerates like Mumbai and Pune, a coastal region of 720 kms in length and dry, arid Zones of interior area of Marathwada and Vidarbha. The targets in road development plan require huge investment from the Government but there are constraints of Funds. The allocations from Government does not match with the requirement of Funds which are required for better highway infrastructure. The Maharashtra Government has, therefore, taken initiative and introduced Build, Operate and Transfer (BOT) Policy first time in India. Therefore, many highway projects are completed under Build, Operate and Transfer (BOT)/Public Private Participation (PPP).

This paper deals with the approach towards the overall development of road network in the state by providing proper thoughts considering required road network and difficulties to achieve target of road development of the state. The author has suggested that the road infrastructure can be developed with proper strategic planning through public and private sector participation.

1. BACKGROUND

Article 19 (1) (g) of the Constitution of India provides all citizens of India a right to practice any profession, or to carry on any occupation, trade or business.

Article 301 of the constitution provides freedom of trade and commerce. Article 21 of the constitution of India protects life and personal liberty. In short, any citizen of India can undertake any legal profession, trade or business, throughout the territory of India and the constitution guarantees every citizen protection to his life and liberty. The freedom of movement is dependent on the infrastructure of the country. The prosperity of a country depends on its infrastructure. The growth of each and every sector mainly depends on the infrastructure. Therefore, there is a need for better infrastructure for social and economical development of a country. To get the free dynamic movement across the country, it is necessary to develop the road infrastructure at a faster pace. The Maharashtra being one of leading states in the country and specially Mumbai, being the financial capital of India fully realize this requirement. However, the State was unable to provide required road infrastructure due to financial constraints. Though, the importance of road development is second to none, adequate funds are difficult to come by, as fund allocations from taxes

collected cannot be increased beyond certain limits.

Historically, the roads were earthen roads meant to carry low speed, light weight animal driven vehicles. The earthen roads were not all weather roads. In monsoon, it used to be difficult to ply the vehicles on these roads. Hence, in the course of time construction of Water Bound Macadam (WBM) i.e. metaled roads was resorted to. Till this level, it was well within the reach of local or State Governments to provide such type of roads. However, the advent of automobile technology produced a range of vehicles which were capable of running with speed. This made it almost necessary to have Bituminous Roads with a smooth riding surface. The construction of such roads is necessarily very costly. The pace of technology was such that it compelled speedy transformation of earthen and WBM roads to Bituminous roads. The quest for better, safer and quicker roads, favours cement concrete roads in comparison to the bituminous roads. Construction of good and durable roads requires huge outlay, which is not available with any government per se.

Road network is an important tool for connectivity. The better the connectivity, the better is pace of overall economic development of people in a particular geographical area. Every village needs to be connected to taluka head quarter which in turn shall be connected well with the districts head

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quarter. Every district shall be connected to the adjoining districts, every state shall be connected with other adjoining states, and every country shall be connected with other neighboring countries. Creating this chain of connectivity (with bituminous road and/or cement concrete road) is a big challenge for State and Central Governments. Since 1991, we have adopted the policy of globalization. This has put further pressure on state and central governments. The governments have meager allocation of funds for improvement and/or construction of roads and even for maintenance of existing road network.

Maharashtra has a peculiar geographical situation. It is having a large hilly area and large number of rivers, nallahs, creeks, etc. under such conditions, the cost of construction of roads is very high. Road construction as per standard and specification even for state highway is difficult through state budget. Hence, most of the highways require huge maintenance cost. It means not only the achievement of R. D. Plan is not possible but it is a double whammy, in the sense that on one hand the target is not achieved and on the other because of inadequate construction not at par with the requirement the commuters suffer badly even though cost of maintenance is always on rise. It means neither substantial length of road infrastructure increase nor good road infrastructure is obtained through state resources.

2. ROAD DEVELOPMENT PLANS

Target as per R.D. Plan and achievements through state grant is impossible within 20 years of plan period. The R. D. plan size from National Highway to village roads is explained as follows :-

2.1 Road development being very important factor in achieving overall growth, due attention was paid to evolve a systematic road development plan as early as 1943. It was obvious that the road development play important role and hence, would undergo revision to keep pace with the time. The Government brought out the following road development plans, in the due course of time;

- i. First Road Development Plan 1941-1961 (Nagpur Plan)
- ii. Second Road Development Plan (1961-1981) (Mumbai Plan)
- iii. Third Road Development Plan of Maharashtra State (1981-2001)
- iv. Fourth Road Development Plan of Maharashtra State (2001-2021) (VISION -2020)

2.2 First Road Development Plan: for 20 years was designated as “NAGPUR PLAN”. This plan categorized

the Indian road network into (a) National Highways – Mainly interstate arterial roads (b) State Highways – Arterial Roads connecting district headquarters (c) Major District Roads – Arterial Road within district, (d) Other Roads – Arterial Roads within district (e) Village Roads – Approach Roads for village connectivity Target of this plan was 26 miles road length for 100 sq miles area.

2.3 Second Road Development Plan: Designed as “MUMBAI PLAN”. Based on Mining Activities, Industrial and Agro Industrial reform in the country. Road development Plan was prepared for faster industrial growth of country. Target of this plan was 52 miles road length for 100 sq miles area.

2.4 Third Road Development Plan of Maharashtra State : The targeted Road length as per 3rd R. D. Plan is 2.76 lakhs km. of all categories including National Highway, Major District Road, Other District Road and Village Road. Thus the target of 3rd Road Development plan (1981-2001) which was to be accomplished by 2001 only is not achieved within stipulated period and it required huge budgetary provision from the State. Due to price escalation, cost per Km is increasing which is a main difficulty to achieve target through available resources with state.

2.5 Fourth Road Development Plans of Maharashtra State : The targeted road length under 4th R. D. Plan is 3.36 lakhs km. To achieve the targeted length an investment of about Rs. 1.5 lakhs crore is required without considering future price escalation. Hence it is obvious that the targeted network cannot be developed within available financial budgetary resources of the state.

Objectivities of 4th R.D. Plan of Maharashtra State Overall Transport Policy –

- Adequate transport capacity to match the projected demand.
- Adequate rural road network to provide connectivity.
- Technological up gradation and modernization of transport equipment.
- Emphasis on safety, efficiency and environment protection.
- Village connectivity with all weather roads to connect all Villages.
- Special consideration to the needs if infrastructure to connect Mining Areas, Power plants. Industrial Complexes, Ports, Agro industrial Areas, Market Centre, Health Centre, Administrative centre, Pilgrimage Centre and wayside Amenities, etc.

From the above data of R.D. Plans (PWD, GOM), it will be evident that no R. D. plan implemented within stipulated plan period. There are many obstacles summarized as follows:

3. OBSTACLES IN IMPLEMENTING R. D. PLAN OF MAHARASHTRA STATE

The growth of any state depends upon its transport activities and dynamic movement of human being. This study is conducted from the available records and sites of Public Works Department (GOM) considering availability of infrastructure (road and bridges). The obstacles in achieving the desired growth are enumerated as below;

- i. In normal course, considering budget provision, the targets which were to be achieved in 2001 would be achieved in 2034, without considering price escalation.
- ii. This does not include four laning of State Highways
- iii. Expressway can't be thought of in normal course.
- iv. Users are deprived from better road facilities.
- v. To complete the target of R.D. Plan 2001-2021; next 20 years will be required in normal course.
- vi. In spite of various schemes of funding (State Budget, Central fund, PMJSY, various state and central finance scheme, Loan scheme from NABARD, HUDCO, WORLD bank, etc. by state and central government since independence, require road infrastructure of the requisite standard could not be achieved till now.
- vii. Huge gap is always observed between required funds for road infrastructure and availability of funds through Government Treasury.
- viii. Motor vehicles on state roads are increasing. Roads with insufficient crust design are getting damaged and cost of repairs and maintenance is increasing.

4. CAPITAL OUTLAY REQUIRED FOR UPGRADATION OF NHS, SHS AND MDRS

Irrespective of obstacles stated in para above, government of Maharashtra undertook the initiative for upgradation of major roads network and bringing it to National standards. The main focus was on the development of industrial connectivity around major cities like Mumbai, Nagpur, Pune, Aurangabad etc. and decided that all revenue divisions should be connected with a at least with four lane roads.

This necessitated decongestion of the roads and establishes a good road network around major cities and district headquarters. National Highway Authority of India (NHAI, GOI) has taken a lead in increasing length of National Highways than targeted under Road Development Plan of Government Of Maharashtra. This seems to be major support by GOI to GOM for road development and thus the length of National Highways increased.

Considering the futuristic economical growth which mostly depends on the road network development, upgradation of National Highways (NHs), State Highways (SHs) and Major District Roads (MDRs) planned and estimated cost of such upgradation worked out. Economical growth of state is mostly depends upon transportation facilities like Air transport, Rail transport, Water transport etc; and all these transport needs better road connectivity. Any industrial growth like agro industry, small scale industry, Minings, Ports, trades etc; also depends upon standard of road connectivity. Thus the probable cost of expenditure with respect to these connectivity as capital outlay for establishing robust network of NHs, SHs and MDRs is about Rs. 3.74 Lakh crores as shown in following table.

Table 1: Capital Outlay required for up Gradation of NHs, SHs and MDRs

S. No.	Classification	Total Road Length (km)	Road length requiring (km) upgradation	Expenditure/Km (Rs. in crores)	Total outlay required (Cr.)
1	National Highway	15111	12103	10	121,030
2	State Highway	30703	20750	6	124,500
3	Major District Road	49560	29500	4	1,18,000
4	ROB, on SH & MDR	210	210	50	10,500
				Total	374,030 (Say Rs. 3.74 Lakh Crore)

5. AVAILABILITY OF CAPITAL OUTLAY FOR ROADS

The central and state governments were aware of the mismatch between demand and supply of funds for projects in road sector. There, various schemes were initiated by central and state governments to fund road infrastructure

projects and loan schemes were also availed over and above the annual budgets of Public Work Departments. In so far as Maharashtra is concerned, this proved to be insufficient. Till date, the state could not achieve even for the target set under the third Road Development Plan (1981-2001). We are lagging behind with a deficiency

of about 1,00,000 kilometers road length considering in fourth Road Development plan (2001-2021). To change this scenario, the state has to resort to different sources of funding for road projects.

The road development had been non-priority sector in the initial years as there was thrust on socio economic and agricultural development till 1994. However, the state Government realized that, unless the road network is developed properly and other infrastructure like connectivity to railway, airport, ports, market center, agricultural area etc. are not connected by good roads the industrial development of state will not be facilitated, the industrial zone around Mumbai, Pune, Nashik, and Aurangabad were the main manufacturing zone where the employment would be generated. It was, therefore, decided by the state to funding to the roads sector. However, the budget provision in the last 19 years is not meets out the demand which is shown in the table given below from the data of PWD, GOM budget provision.

Table 2: Capital Outlay for Roads

Sr. No	Financial Year	Plan outlay Demand (Cr)	Actual Outlay (Cr)
1	2000-2001	1200.00	640.78
2	2001-2002	1400.00	1009.00
3	2002-2003	1600.00	643.88
4	2003-2004	1819.20	1049.52
2	2004-2005	2543.00	720.69
6	2005-2006	2716.40	1184.36
7	2006-2007	1990.00	1489.59
8	2007-2008	2714.70	1704.72
9	2008-2009	3347.00	2553.00
10	2009-2010	4899.43	2989.69
11	2010-2011	7675.12	2550.66
12	2011-2012	6972.34	2586.00
13	2012-2013	5257.61	2986.31
14	2013-2014	4687.68	4451.47
15	2014-2015	5193.78	3706.08
16	2015-2016	4019.33	4769.51
17	2016-2017	7018.33	4369.00
18	2017-2018	14836.27	7000.00
19	2018-2019	19133.51	8090.00
	Total	94823.70	54494.26

Outlay availed as above for 19 years was Rs. 54494.26 crores is only 44.46% of total state outlay. Considering

available outlay road sector development is impossible to achieve Road Development 20 year plan and hence uptill now deficiency in road sector is increased manifold which reflect on overall economical development of the state.

The problem of paucity of funds for road development is a perpetual phenomenon. The completion of roads is resorted stage wise as partial funds are only available. This results into a deficient road system. As at every stage, only 40-50% of the required funds are available; construction in stages and that too through various schemes is attempted. Most of the earthwork and WBM is completed under Employment Guarantee Scheme Programme to give employment to the rural populace. Naturally this partially stage wise construction results into substandard roads. It is but natural that such substandard road would need a large chunk of funds for maintenance during and after every monsoon. Thus, more than one third of the available funds are required merely to repair the existing roads.

6. EFFECT OF STAGE CONSTRUCTION THROUGH DIFFERENT ORGANIZATION

To add to this problem of stage constructions of roads with poor quality, there being different agencies for the construction of roads, such as, PWD, MSRDC, MMRDA, Zilla Parishads, Gram Panchayats, etc. lack of coordination between these agencies results into duplication and/or substandard work. Secondly, not that all agencies are well versed in construction of roads. The ultimate result is that one third of the total funds available go for maintenance which is a revenue cost and not as a capital gain in the form of new, improved roads.

Another issue related to stage construction is populist decisions made by politicians. If the funds are available for the construction of, say, 100 kilometers, there will be insistence to complete more length say 150 kms within the same grants with suggestions to water down the standard and specification. Though such attempt provides false satisfaction in initial moments, in the long run it turns out to be a costly exercise. It needs to be borne in mind that the road construction is a science which has set of standards and specifications. Any tampering with standards and specification is costly and not advisable.

The government always finds it in a dilemma. On one hand the grants are limited and on the other the demands are too many. Such a situation compels the government to find temporary solutions to get a deprive from the competing demands. Any deviation from the scientific approach is bound to be costlier in the longer run. It is always in the interest of the public that the government adopts a well thought out policy instead of indulging in fire fighting techniques.

7. RENEWAL, REPAIR, MAINTENANCE OF ROAD THROUGH NON PLAN GRANT

The problems are further aggravated due to paucity of funds for timely renewal of roads already constructed. Also, the tendency of Indian people of overloading vehicles commuting on the roads is detrimental to the roads. Even a ban from Supreme Court on overloaded vehicles has not resulted into any respite from the situation. These problems are more severe in case of high density traffic. If government focuses on the maintenance of these high density roads through its funds, it has to neglect the other low density roads.

The exercise of pothole feeling is a sheer waste. During and after every monsoon, we face the same problems of bad roads. This is not only a case of village roads, but it is also a case of state and national highways, in some stretches. This results into multiple problems, right from traffic congestion to health of commuters and vehicle. This also results into more accidents, some of them are fatal. There is lack of pre-and-post monsoon planning. The budget which is used like this is tax payers money, which shall not be used for such wasteful purposes.

For renewal, repair and Maintenance of existing road length, Public Works Department and Zillah Parishad for state roads get yearly grants from state and central government which is less than 1/3rd of demand as shown in following table.

Table 3 Fund Available for Renewal, Repair and Maintenance of Roads and Bridges

(Rs in Crore)

Sr. No.	Year	Demand for Road	Available Funds	% of Allocation made available
1	2000-2001	2334.72	844.92	36.15
2	2001-2002	3001.63	834.62	27.81
3	2002-2003	3401.60	694.68	20.42
4	2003-2004	4321.73	834.21	19.30
5	2004-2005	4226.05	904.90	30.91
6	2005-2006	4328.82	1065.74	24.62
7	2006-2007	4544.63	520.99	33.47
8	2007-2008	4771.85	503.68	33.53
9	2008-2009	5597.38	542.40	27.56
10	2009-2010	5829.70	802.50	30.92
11	2010-2011	6412.67	1829.76	28.23
12	2011-2012	7053.39	2171.48	30.77
13	2012-2013	3758.70	1793.48	47.72
14	2013-2014	6043.62	1766.19	29.22
15	2014-2015	6665.63	2348.58	35.23
16	2015-2016	7257.83	1610.42	22.19
Total	16 Year	70503	19066	Avg-27%

From above table it will be evident that against the requirement of Rs. 70,503 Crore, only Rs. 19,066 cores of non plan grant for repairs and maintenance has been allocated in last 16 years. Which is just 27% resulting into poor maintenance of roads. Renewal cycle for already constructed roads is prolonged from 3-5 years to 10-15 years, which is bound to result into deterioration of road length, mostly during monsoon period.

From the above, deliberation target as per Road Development and achievement through state grant appear to be difficult for want of adequate funds through plan and non plan outlay as there is not much incremental increase. During the period 2001 to 2019, the increase in road length is only about 30000 kms only. It means in an average only about 1700 km road length is added every year which is very meager compared to balance length as per 4th R. D. Plan. Considering the necessity of good roads alternative strategy is very much essential for road infrastructure.

8. NECESSITY OF GOOD ROADS

If we compare the total cost of construction and repairs of weaker roads with that of construction of strong roads as per norms, the construction of good quality roads as per standards and specifications would always stand out, though it requires a substantial amount of initial outlay. But repair and maintenance cost will be low hence effectively Life Cycle Cost will be less. On such roads, commuters will get good transport services.

For the accelerated growth of automobile sector, both in the form of new technology and in the form of huge number of vehicles being sold and coming on the roads, the bad roads are treated as bete noire. There seems to be a paradox, in the sense that on one hand there is an exponential growth in the automobile sector and on the other hand, the reside lining in the quality of roads. If this continues to happen, it will hamper the overall industrial and agricultural growth of the state and the country. Perhaps, that could be the reason for stagnated growth rates of industry and agriculture and GDP on the whole.

Development and growth has a human face. A person who is travelling through congested roads every day spending hours together on road, faces down side effects of health problems, loss of time, lose of vehicular operation cost, energy and money. He is almost exhausted at the beginning of the day itself. This hampers his/her workplace performance. This becomes a deterrent for his/her growth plus it is deterrent for the overall industrial growth also. The output of such person is always bound to be less than what he/she can otherwise perform. Traffic jams are becoming a regular feature on city roads. It is also not possible for him/her to shift to nearby places, because of poor roads in village, taluka, and other towns. Good

roads and connectivity can reduce a lot of health, social and economical problems of individuals and of society. Just like blood vessels in human body, the roads are blood vessels in national body. If any blockage is developed in the blood vessels it kills us brutally. Like-wise, the blockage in the traffic flow is killing the national economy.

Majority of these projects are bituminous roads. Due to untimely rains and such problems, the maintenance cost of the same is becoming very high. It seems that this has not been forecasted properly. So the roads are not maintained timely. This results into quarrels between the government and public unrest on this issue. It is now almost accepted as a fact that cement concrete roads do not face such problems. Hence, all major heavy density traffic projects henceforth shall be constructed to/upgraded to cement concrete roads. This will reduce the various problems associated with frequent repair and maintenance.

Even after more than 72 years of independence, 100% village connectivity is yet to be achieved. There are over 150 villages which are still not connected by any type of road in Maharashtra. Most of the villages requires long bridges, hilly roads and water transport Jetties, as some villages are situated on island. As the population of these villages is meager, the PPP model is not useful. The government has no any alternative but to achieve the connectivity through budgetary allocation. The budgetary allocation to such work would be possible only by diverting budgetary provisions meant for high density roads.

9. EXPECTATION OF ROAD USERS

There is a paradigm shift in the mindset of people after globalization. In the past, people used to be happy with mere availability of road. Their expectations of development of roads were limited to up gradation from earthen road to WBM and then to bituminous road. Now the situation has changed. People are not content with mere up gradation of riding surface.

Generally public expect accident-free roads, they expect more comfort level while driving on the roads, they expect safety and security, they expect aesthetics of roads, they expect proper road furniture, they expect arboriculture and landscaping, they expect smooth grade and surface, they expect road side facilities like bus- bays, parking areas, rest areas, market plaza, agro based service stations, daily need based services, vehicle garages for repairs, motels, hotels, food malls, toilets, medical services along road sides. Police chauki along road, side trauma care centre along road side, service roads, flyovers, underpasses, high level roads, tunnels, safety from accidents like brufen wire ropes, metal crash barriers, durable roads, bump-less surface so on and so forth. And they want all these on all

types of roads and also, they want it instantly. Meeting these expectations is a costly affair. This requires a huge outlay of funds, which can be made available through PPP model, which is well established source globally.

10. BENEFITS OF GOOD ROADS

Available land width along with existing road length is required to be utilized for widening improving and providing additional facilities for the road users protect the Government Lands from encroachments at various places upto the boundary of right of way, which is not possible in normal course. Even land can be protected through Arboriculture at the boundary so that no encroachment will take place in future. Secondly, Toll plaza on the road creates a spot of safety where personnel are available round the clock. Road users can communicate if anything untoward happens on the road like accident, robbery, mishap, etc. Toll plaza can turn out as information centers for the road users. Even policing can be possible to keep watch on vehicles and activities of road users. Toll plaza can be used to coordinate and to get round the clock information useful to the public and Government.

The pace of urbanization is a matter of concern globally. India is not an exception to this. But here the problem is worst due to regional imbalance. Mumbai-Pune-Nasik corridor is well developed and catering to about 40% of the population of the state. People are shifting from villages to metros in such corridors. This migration is causing troubles for agriculture sector. It is also creating unemployment problems. It is also putting unmitigated burden on city infrastructures. One of the reasons for the same is obviously the bad roads and bad connectivity. If better quality roads and better connectivity is given at village and taluka level, at least some migration will be avoided.

Such migration problem has many facets. It is forcing the cities for vertical development, putting pressures on their infrastructure. It is creating traffic jams, leading towards different environmental and health related problems. It is escalating the living costs beyond the capacity of the common man. It is leading towards more criminalization leading to law and order situation. On the other hand, for villages, the possibility of growth is almost standstill. In the rural area agricultural land is there, but there is no one to work on it. During pre-independence era, we had self-reliant villages. Now we have defunct villages. This two-fold problem can be sorted out to some extent by providing good quality roads and good connectivity right from village level.

To address the overwhelming demand of better road network. Government of Maharashtra has been a pioneer

in implementing PPP policy. About 150 projects has been approved and implemented by GOM and about 44 projects by GOI under PPP to expedite the road development projects for Rs. 64366 crore and 6487 km length of 4/6 lane roads are completed. Considering the huge money required within short period for road development proper infrastructure planning is essential otherwise such big ticketing projects will be extra financial burden over public sector, Infrastructure Development Planning regarding PPP projects is described below

11. INFRASTRUCTURE DEVELOPMENT PLANNING

For road infrastructure development network planning considering importance of road is essential. For this purpose network clustering based on traffic potential, industrial development, agricultural development, market places, educational location, tourist locations, etc. should be consider.

The clusters can be formed in different ways. Firstly, we can have one district as a cluster. For that district all the road network will be classified accordingly. Secondly, we can have a combination of two or three adjacent districts. Thirdly, we can group one high density traffic district, one medium density traffic district and one low density traffic district. Each cluster then shall be the part of once cluster contract. Such contract is suitable to build all types of roads for the cluster.

Another aspect of the problem is classification of roads on the basis of vehicle counts only. Presently, the roads are classified into three types: High density corridors (covered mostly through National and State highways), Medium density corridors (covered mostly through Major and Other District Roads), and Low density corridors (covered mostly through Village roads). However, there are other concerns such as, mining activities, tourist places, pilgrimage, industrial belt, IT industry, port, etc. The roads related to such types shall be considered as High density corridors and treated accordingly. This will enhance the growth and development of these areas. Maharashtra has plenty of such places, which require instant solution for the situation.

The financing of these roads can be done partially through tolls, through annuity payments, and through other schemes funds. This will create overall development of the road infrastructure. And it will also partially reduce the regional imbalance; at least the ball will be set in rolling in that direction.

This combination of all types of roads together will give the benefit of “economies of scale”, which will reduce

the initial cost of the project. Also, a sort of government assurance of paying annuity at pre-fixed rate on regular intervals will reduce the financial risk of the developer. This way we can bring clarity in this whole process by eschewing arbitrariness and adhocism. Again, the toll collection will not be a responsibility of the developer; it can be auctioned and handed over to a specialized toll collection agents. This will help the developer to focus on the construction quality and maintenance issues.

The scheme of clustering and master plan will help the financial institutions in reducing their risk of financing such projects. This may also further reduce the rates of interest, which will again help the developer and the government to reduce the life cycle cost. In a way, the government can become equity partner in the whole process of road infrastructure construction. The toll collection agent shall deposit the money of his commitment in advance, which will reduce the pressure on the government, developer and financial institutions. The user of road facility will get good infrastructure on most of the roads throughout the districts. But he need not pay for it in totally. For some facilities, he will pay the tolls and remaining he can enjoy at the cost of other road developing agencies. It may be termed as win-win‘ situation for all the stakeholders in the process.

This can fuel tourism industry in many ways – such as, cluster tourism, medical tourism, Agro tourism, pilgrimage tourism, etc. Again, this will help industries to have forward and backward linkages established in a more organized and faster ways. This will also help the farmers to have local market along road side and to move their goods at speed from one place to another and get better in bargain.

The state has experienced an exponential growth through the examples of developed road like Mumbai-Pune-Kolhapur, Pune-Ahmednagar-Aurangabad-Jalana-Watur, Ahmednagar– Kopargaon–Manmad, Nagpur–Jam–Chandrapur, Nagpur–Amravati, Mumbai-Nasik–Dhule, etc. The pace of growth after completion of Mumbai Pune Expressway is many folds compared with the pace of growth prior to the construction of Mumbai Pune Expressway. It is for anybody to discern that today Kolhapur road user can come to Mumbai from Kolhapur and can go back to Kolhapur on the same day with out making ahalt which was not possible earlier. Similar kind of Economical Development can be possible after overall network developed in the state.

Considering the obstacles, difficulties and limitations of public sector following recommendation are proposed for overall growth of road infrastructure.

12. RECOMMENDATIONS

- i. Independent strategy like PPP model should be adopted for faster development for high density corridor roads. Funds generated from these roads can be utilized for other low density corridor roads to develop cluster of road network.
- ii. It is imperative to have a Master Plan for all the roads in the state. The Master Plan shall specify distinctly about which projects shall be considered as (a) BOT Toll, (b) BOT Toll along with Annuity and (c) Annuity. Also, it shall contain that the other roads is to be built by using funds from central and state governments (which are available through various schemes).
- iii. Strong public sector with a long term policy can only implement PPP projects successfully in partnership with the private sector. Long term policy will lead to evolution of strategic relations help with the private sector to deliver the facilities to commuters.
- iv. It is the responsibility of the public sector to create a conducive environment for the furtherance of PPP policy. The relationship in between the public sector and private sector should not be in the form of a master and servant.
- v. It goes without saying that implementation of PPP has to be necessarily a synergetic endeavor to reap the best results. Private sector should also not come only to earn profit through PPP project but it should have a nationalistic goal to create facilities for the commuters as a contribution to the nation.
- vi. PPP model comes handy whenever government wants to create assets at faster rate. It is needless to state that good infrastructure leads to prosperity to the country. Value addition projects should be done through PPP for which ethics, efficiency and effectiveness is required to produce affordable and reliable services to meet the basic human needs of the citizens. Such resources can be used in facilitating sustainable local economic and social development to generate employment and eliminate poverty and to enhance per capita income.
- vii. Privatization is not a remedy for all ills but still it can be harnessed to create good assets by following proper rules and regulations with transparency. PPPs are impossible without honest and competent services and stable public sector. PPPs need institutional capacity, for which private sector should work with principles and honesty to achieve the nationalistic goals.
- viii. Public Private Participation relieves the Government from the financial risk burden and construction risk in relation to the projects.
- ix. Public Private Participation accelerates growth in the economy through PPP project and a ripple effect in the private sector.
- x. Public Private Participation leads to increase in efficiency and productivity and the provision of a better service to the public increase in traffic speed as good quality road is available.
- xi. Time saving, distance saving and ultimately saving in vehicle operation cost due to one way movement on four or more lane roads, if central median with tree plantation should be provided as a barrier.
- xii. Public Private Participation will create value for money in the existing infrastructure network, if proper geometrical improvement, safety measures follows.
- xiii. Public Sector/Government has a limited resources and being a welfare state huge amount required for creation and maintenance of road infrastructure is very much difficult to come. Hence, public sector sought alternative source of private sector financing to create assets in the larger public interest.
- xiv. PPP is one of the tools to generate funds which can be utilized to create a good road infrastructure but public sector should apply its surgical mind for PPP project. Build-Operate-Transfer Schemes are successful if both the parties are knowledgeable and well versed with the strength of each other, before signing the contract.
- xv. While operating PPP model government is not going away but regulating the private/public fund and capacity to generate capital structure for development to create more facilities to commensurate with the international development.
- xvi. As far as the road development is concerned the government should pursue the PPP model vigorously especially where it could be successful and then gainfully construct durable rural road network which necessarily cannot come up without robust budgetary support.
- xvii. PPP Project should be such developed that it would fully cater to the requirements of road side habitations with optimal project cost and optimal concession period. The development can be planned phase wise. But the phases should be such that the development would always be commensurate with the requirement of traffic.
- xviii. In the last, but the foremost is that there should be a coherent policy on PPP projects which shall to the possible extent be free from capriciousness.

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ROLE OF COURTS IN THE IMPLEMENTATION OF ARBITRATION AWARDS AND REASONS OF DELAYS THEREOF



G.S. MANN¹

1. SCOPE OF CHALLENGE OF AWARD IN COURTS

The award given by an arbitrator can be challenged in the court of law under Section 34 of Arbitration & Conciliation Act, 1996 (as amended) if it is against 'Public Policy of India' under the following sub-heads -

- a. Fundamental Policy of Indian Law – It includes -
 - i. Compliance with statutes and judicial precedents;
 - ii. Need for judicial approach;
 - iii. Natural justice compliance;
 - iv. Wednesbury reasonableness;
- b. Interest of India;
- c. Justice or morality; and
- d. Patent Illegality -
 - i. Contravention of substantive law of India;
 - ii. Contravention of Arbitration & Conciliation Act, 1996 as amended;
 - iii. Contravention of the terms of the Contract.

It has been laid down by the Hon'ble Supreme Court (Associate Builders versus Delhi Development Authority decided on November 25, 2014) that when any of heads/sub-heads of test of 'Public Policy' is applied to an arbitral award, court does not act as court of appeal. Interference of the court is permissible only when findings of arbitrator are arbitrary, capricious perverse, or when conscious of the court is shocked or when illegality is not trivial but goes to the root of the matter – not when merely another view is possible.

It has further been held by the Hon'ble Supreme Court in this judgment that an arbitrator is the ultimate master of quantity and quality of evidence while drawing arbitral award. An award based on little evidence or on evidence which does not measure up in quality to a trained legal mind cannot be held invalid. Law laid down by the Apex Court is the guiding factor for all subsequent decisions of various courts.

1.1 Time frame under the Act to challenge the award

Under the provision of Section 34(3) of the original Act an application for setting aside is required to be made in the appropriate court within 3 months on the receipt of the award. Further one month's extension is allowed on the satisfaction of the court.

1.2 Time frame for the courts to decide objections against the award

In NCD Delhi awards are directly challenged in the High Court whereas in States like Punjab, Haryana etc. initial challenge to award lies at the level of District Judge or his assignee. No time limit has been made out in the arbitration & conciliation act, 1996 for the courts to dispose of these cases. It is an accepted position that there had been unusual delays at the level of courts to decide the challenge of awards. It will be befitting to quote an example here of two pending cases pertaining to M/S. Afcons Pauling JV versus State of Punjab. In both these cases awards contain future interest @ 12% PA. These awards were challenged in the District Court during the year 2007 and 2009 respectively. One case pertaining to the year 2007 has been decided very recently and the other is still pending in the district court. Channels like appeals in the High Court or Supreme Court is still to be crossed. When the finality of these awards will be achieved is any one's guess. It is not an isolated example but reflects the general treatment to awards in the courts.

1.3 Sufferings of the parties due to delays

Due to delays both parties suffer huge losses. The petitioner contractor suffers on account of the fact that he is deprived of the money rightfully due to him. As a result his financial cycle gets effected resulting in delay in the completion of this and other projects being handled by him. Respondent party which invariably is the Government suffer huge financial loss in the form of future interest on award money which in many cases ends up many times more than even the original amount. Such

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delays are even killing the very purpose of arbitration as an alternative dispute settlement mechanism for early and cheaper means of dispute settlement.

1.4 Role of parties in delays

Arbitration cases pertaining to government departments are being defended by the Government pleaders who are generally not properly equipped to defend their employer for the following reasons –

- i. Government Pleaders are heavily burdened with day's work with variety of cases of all sorts. Arbitration cases even do not fit in to their scheme of things. It is also attributed to the fact that being of general nature they are not equipped with latest laws on arbitration. They also lack back ground knowledge of the dispute which generally is of complex technical in nature.
- ii. Government Pleaders do not get proper feedback from the concerned departmental officials. It is normal happening with the departments that when projects are completed or nearing completion the officials handling the project gets shifted before its financial close to other place of convenience to avoid the financial and technical accountability. Due to time lapse and at the time of dispute resolution the officials at the helm of affairs are neither conversant with the background of dispute/s nor interested to understand the same. Since these officials are not being personally involved they consider these cases a mere liability.

1.5 Provisions made in the amended ACT

In the amended Act of 2015 (No.3 of 2016) and (No.33 of 2019) section 34(6) has been introduced reproduced below –

“An application under this section shall be disposed off expeditiously, and in any event, within a period of one year from the date on which the notice referred to in sub-section (5) is served upon the other party.”

However courts are not adhering to this provision and the matter is left at the mercy of the councils generally having conflict of interest.

1.6 Creation of Commercial Courts

Considering the gravity of the problem and in order to provide for speedy disposal of high value commercial disputes involving complex facts and question of law the bill namely Commercial Courts, Commercial Division and Commercial Appellate Division was passed by the Parliament in 2015 and the same was notified as “The Commercial Courts, Commercial Division and Commercial Appellate Division of High Courts Act, 2015” (4 of 2016). Under the Act Commercial Courts were constituted at the District level and High Courts to deal

with arbitration and other commercial matters. Provisions of the Code of Civil Procedure, 1908 also stands amended suitably under the provision of Section 16 of this Act. Under the provision of this Act all the Arbitration Cases of specified value pending in District Courts or High Courts stand transferred to Commercial Courts especially created for such purpose.

1.7 Time limit set under the Commercial Courts Act for the disposal of objections filed by the aggrieved party

As per stipulation in Section 14 of the said Act the Commercial Appellate Division shall endeavour to dispose of appeals filed before it within a period of six months from the date of filing of such appeals.

1.8 Has the objective been achieved?

A look at the pendency of cases in courts since the creation of commercial courts will show that inspite of new enactment there is no visible improvement in the disposal of these cases. It is attributed to the lack of will to push through these cases both at the level of lawyers and that of courts. Time limit fixed under Act to dispose of these cases is not being adhered to. The process of date after date is still going on.

1.9 Advantage under amended Arbitration and Conciliation Act to enforce the award

Under Section 36 of the original Act of 1996 enforcement of the award under CPC, 1908 was subject to the following conditions –

- i. That time limit to challenge the award under Section 34 (3) had expired or
- ii. Such application having been made, it has been refused.

Under new Act this section stands amended by introducing Section 36(2) which states, “Where an application to set aside the arbitral award has been filed in the Court under Section 34, the filing of such an application shall not by itself render the unenforceable, unless the Court grants an order of stay of the operation of the said arbitral award in accordance with the provisions of sub-section (3), on a separate application made for such purpose.”

Taking advantage of this amended section parties are now resorting to enforcement of the awards without waiting for the outcome to the challenge of award under Section 34. Once award is enforced and money paid the application to challenge the award becomes almost in fructuous for lack of interest by concerned party. Thus the very purpose of challenge to the award procured against public policy of India gets defeated.

2. Conclusions

Though the challenge to arbitral awards under Section 34 of the Act is very limited because under ‘public policy of India’ court does not act as court of appeal but still even the genuine awards are being challenged in the courts. Main purpose of challenge in the Court by the Government officials is to avoid the financial responsibility. This tendency is causing huge loss to the State Exchequer which needs to be curbed. Only such awards needs to be challenged which falls within the ambit of violation of public policy. Responsibility to pursue these cases actively in the court should rest only with the officials who had actually handled these projects during execution.

i. Challenge to awards should rest only with the High

Court as is in Delhi. State Governments may make the necessary amendments. This will go a long way in early disposal of awards.

- ii. Only competent Engineers having capability of deliver should be the guiding criteria for posting on important projects and not be changed till the project comes to financial close. Favoritism or manipulation of posting on such projects needs to be avoided.
- iii. Engineers and other related Government officials handling big projects needs to be regularly updated in regard to techno-legal issues through expert discussion by arranging seminars and meetings.

IRC Technical Committees Meeting Schedule for February, 2021

Date	Day	Time	Name of the Committee	Venue
01-02-21	Monday	04:00 PM	Subgroup B-3 (Liquefaction of Soil) Foundation, Sub-Structure, Protective Works and Masonry Structures (B-3)	Online Platform
06-02-21	Saturday	11:00 AM	Bearings, Joints and Appurtenances (B-6)	Online Platform
		11:30 AM	Mechanization & Instrumentation (G-4) Road Maintenance and Asset Management (H-6) (G-4 & H-6) Joint Meet	
		03:00 PM	General Design Features (Bridges and Grade Separated Structures) (B-1)	
13-02-21	Saturday	11:00 AM	Steel and Composite Structures (B-5)	Hybrid Platform

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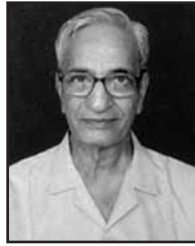
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POTHOLES IN FLEXIBLE PAVEMENTS



P. M. DESHPANDE¹

ABSTRACT

The paper discusses reasons of potholes development in flexible pavements and measures to be taken to prevent their formation. It examines flaws in mechanistic models being used for designing of flexible pavement. Wary of potholes, CIDCO had carried out some experimentation in design and construction of flexible pavements in order to prevent damages to roads. On the basis of the outcome of the experiments, the author have noticed some inadequacies in modeling of pavement mechanism presently being used as basis of design. The major inadequacy is seen in ascribing value of Resilient Modulus to unbound layers of flexible pavements. It is difficult to imagine elastic recovery of strain caused by wheel load in unbound layers of the pavement. In practice the recovery is caused by further movement of wheel load. So it is proposed to term it as Virtual Resilient Modulus (VRM) instead of Resilient Modulus for Granular base and Sub-base. The VRM takes in to consideration contribution of moving wheel load to recovery of pavement strain resulting from wheel load. It has the potential of making the design fully analytical using design inputs of loading and speed of traffic, inter-granular friction, environmental variations in material properties, etc. It also suggests need to make use of HDPE geo-grids to ensure smooth functioning of the mechanism in extreme environmental conditions like temperature variation, rainfall, weak sub-soil, flooding, presence of other services etc in the design for pothole free roads.

1 INTRODUCTION

Flexible pavements are so named because the total pavement structure deflects under load. A flexible pavement structure is typically composed of several layers of materials. Each layer receives loads from the layer above, spreads them out, and passes on these loads to the next layer below. Thus the stresses are reduced, which are maximum at the top layer and minimum at the top of sub-grade. In order to take maximum advantage of this property, layers are usually arranged in the order of descending load bearing capacity with the highest load bearing capacity material (and most expensive) at the

top and the lowest load bearing capacity material (and least expensive) at the bottom. The flexible pavement layers reflect the deformation of the lower layer on-to the surface layer. The top layer is generally bitumen bounded. The other layers are generally unbounded. It is seen that pavements which are built on weak soils, experiencing flooding and subjected to heavy wheel loads get damaged

2 OBSERVATION REGARDING PREMATURE FAILURES

Inspite of the improvements in materials and design technology, the flexible pavements—especially in urban roads - are suffering premature damages. Pothole problem is Universal. Despite designing pavements for 10 or 15 years life, the potholes appear in initial few years only – predominantly during monsoon. Generally, blame is put on construction. But the scale of pothole formation is so wide that construction alone cannot be blamed for its occurrences. So it is necessary to investigate design adequacy. In fact it is desirable to review the mechanism of load transfer and adequacy of modeling presently being assumed for design purpose. The Urban areas are generally inundated in monsoon. So there is an urgent need to develop better understanding of mechanism of transfer of wheel load to sub-soil that is amenable to mathematical modeling and which can reflect performance of pavement under various loading and environmental conditions.

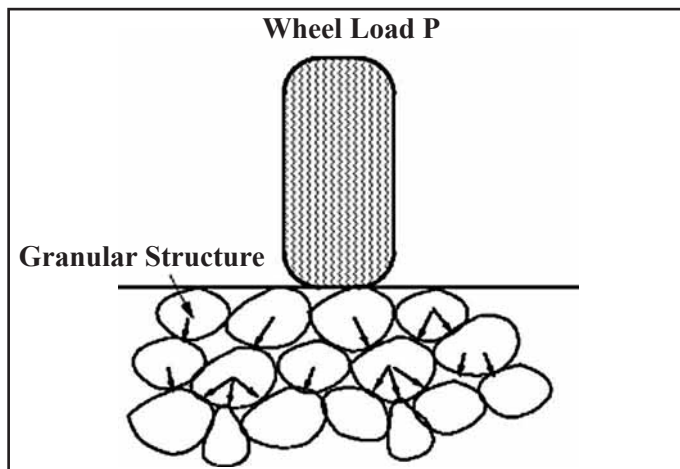


Fig. 1 Wheel Supported on Granular Layer Showing how Load Spreads (Google)

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3 DESIGN MODELS

3.1 The IRC:37 philosophy of pavement design involves designing pavements for satisfactory functional and structural performance of the pavement during its intended service life period. Performance of the pavement is explained by performance models which are either (a) purely empirical (only based on past experience) or (b) mechanistic-empirical, in which the distresses/performance are explained in terms of mechanistic parameters such as stresses, strains and deflections calculated using a specific theory and as per a specified procedure. It is desired to look into the design model and see if there is any inadequacy with respect to modern traffic – loading and speed.

3.1.1 Empirical design-An empirical approach is one which is based on the results of experimentation or experience. Some of them are either based on physical properties or strength parameters of soil sub-grade. In some situations the empirical design can be best suited. It will involve construction of sample roads and observe the performance and adopt the sample best performed under all loading and environmental conditions.

3.1.2 Mechanistic-Empirical Design - Empirical-Mechanistic method of design is based on the mechanics of materials that relates input, such as wheel load, to an output or pavement response. In pavement design, the responses are the stresses, strains, and deflections within a pavement structure and the physical causes are the loads and material properties of the pavement structure. The relationship between these phenomena and their physical causes are typically described using some mathematical models. The theory selected in IRC:37 for the analysis of pavements is ‘linear elastic layered theory’ in which the pavement is modeled as a multi-layer system. The bottom most layer (foundation or sub-grade) is considered to be semi-infinite, and all the upper layers are assumed to be infinite in the horizontal extent and finite in thickness. Elastic Modulus, Poisson’s ratio and thickness of each layer are the pavement inputs required for calculation of stresses, strains and deflections produced by a load applied at the surface of the pavement. Now for simplicity the performance of the pavement is related to a value called resilient modulus for both unbound and bituminous bound pavement layers. Resilient Modulus (MR) can be defined shortly as elastic modulus of a material under repeated loads. The MR can not be directly evaluated in the field. Presently it is empirically related to CBR and other tests.

3.2 The elastic property of any material is derived from the bond between elementary particles. In case of unbound granular layers there is absence of binding material and hence the bond. So it becomes difficult to account for the elastic property of unbound granular

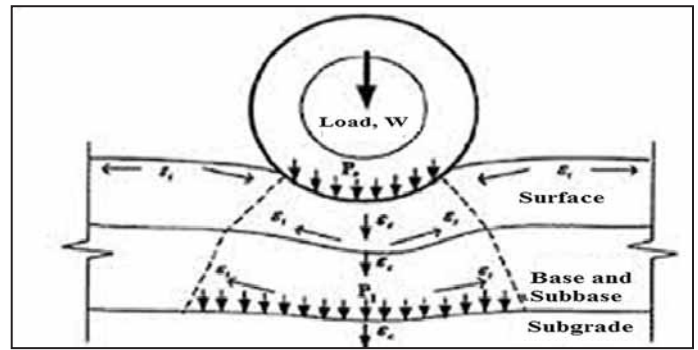


Fig. 2 Stresses Generated in Different Layers by Wheel Load (Google Image)

layer. The present day flexible pavement layers have different functions. The top bituminous layer has a function of restricting deformation due to wheel load while the base course gives the flexibility. The sub-base gives base appropriate platform to mould and absorb stress generated by wheel load. The sub-grade insulates the pavement from sub-soil disturbances due to environmental changes. Different pavement layers recover the strain resulting from wheel load either by virtue of its intrinsic elastic resistance or by passive pressure of surrounding material or by virtue of movement of wheel. The passive pressure generated in surrounding material is adequate only to resist light wheel load. The heavy wheel load results in generation of strain under the wheel and upheaval in immediate vicinity of wheel (**Fig.2**). When wheel moves forward, the upheaval and compressive strain moves forward and strain behind the wheel is recovered. So the elasticity of granular pavement layer is the result of moving wheel load and confining stresses on granular particles. Thus apparent elastic property of layers can be attributed to interaction of dynamic wheel load and inter particle friction of unbound materials of the layer and so it can be called as virtual resilient modulus.

4. REASONS FOR DAMAGE TO PAVEMENT

4.1 It is a common experience that the flexible pavement is damaged due to saturation by water, more traffic intensity and clayey soil or marshy sub-soil, disturbance of underground services etc. When pavement is saturated with water, water reduces inter particle friction which reduces horizontal (confining) stress and to that extent increases the vertical stress. The vertical stress then penetrates sub grade and results into excessive settlement. If sub - soil is clayey soil saturated with water, then its shear strength is unable to bear the excessive load which results in permanent settlement of the pavement. The settlement of sub grade then results in settlement of layers above which creates potholes. If sub – soil is hard and loses inter layer friction, then the wheel load causes more upheaval which results in cracking of asphalt surface. The cracks then admit rain water which ultimately leads to formation of pothole. This synthesis of pot holes

is in agreement with the observation of US Army Corps of Engineers that pothole formation requires two factors to be present at the same time: water and traffic.

4.2 Water weakens the soil beneath and also granular sub-base and base layer of the pavement, while traffic applies the loads that strain the pavement to permanent settlement. Potholes also form progressively from fatigue of the road surface which can lead to a precursor failure pattern known as crocodile (or alligator) cracking. Water also weakens the Granular layer. If particle size of the layer is small, it undergoes increase in volume when saturated with water and cause disruption of upper asphalt layer. Wheel load on pavement results in pumping of water and injecting it into asphalt layer. The pumping of water into asphalt layer results in stripping of aggregate and consequently asphalt layer loses bond. The loose stones are thrown out due to force exerted by wheel. In urban areas tree roots also damage the pavement which can also result in creation of potholes.

4.3 In some cases potholes are formed due to unyielding sub-soil which cannot provide adequate friction to slippage of granular material in base/ sub-base. Under such circumstances base and sub-base particles heave up in the vicinity of wheel which results in surface cracks in heaved bituminous layer leading ultimately to formation of bumps. This phenomenon confirms that only a partial wheel load is supported by sub-soil and balance wheel load is supported by flexural strength of granular layer by virtue of apparent elastic modulus resulting from dynamic wheel load.

4.4 The recent increase in wheel loads, use of multi-axle vehicles and increase in tire pressure have resulted in load penetration deep into sub-soil. The wheel load of a single wheel and group of wheels of the same weight results in differential load penetration. In the case of the multi-axle vehicles, with reduction in confining pressure, 2nd axle passes on to position of 1st axle without permitting strain by 1st axle to restore completely. This results in virtual wheel load to exceed the actual wheel load. The confining pressure on granular aggregate decides the critical distance between two axles required to restore strain created by 1st axle by the time 2nd axle reaches that location. The confining pressure is dependent on the inter-particle friction. As the friction reduces the critical distance between the axles increases. It is also a function of speed of the vehicle. So for certain value of the friction, two-axle vehicle can cause apparent load to be in excess of actual wheel load. The clayey soil sub-grade can undergo dramatic transformation when it changes from dry to water-saturated condition. When saturated a little additional load can cause shear failure and sometimes can start flow of the soil. Further if the soil is expansive, then it can cause upheaval of the pavement which manifests in potholes.

4.5 The mechanism of pothole formation in flexible pavement can be grouped as follows:

- i. Water – saturation of granular layer reduces inter-particle friction. This results in reduction in Virtual Resilient Modulus (VRM) of the layer. The decreased VRM results in permanent settlement and increase in load on layer below.
- ii. Water – saturation also causes pumping of water into layer above (asphalt). The water under pressure results in breaking of bond, which reduces Resilient Modulus (RM) causing failure of asphalt layer.
- iii. Water – saturation of clayey and expansive sub-soil causes upheaval of sub-soil and layers above. Thus reducing RM of layers above.
- iv. Very hard sub-soil offering almost no frictional resistance to sub-base/base material results in slippage of materials from unbound layers..
- v. Increased wheel load, Tire pressure, and use of Multi-axle vehicles results in deep penetration of load. The load penetrates deep into sub-soil and causes permanent settlement of foundation and corresponding settlements of layers above.

5 EXPERIMENTATION BY CIDCO & OTHERS

5.1 Navi Mumbai is developed mostly on Marine Clay, Volcanic Ash and Tuff rock. The roads constructed in the city initially using standard Maharashtra PWD specifications. The roads could not stand even first few showers and used to develop potholes/craters. It was thought that this can be avoided by providing stable foundations by stabilising the soil. Various ways to strengthen the weak foundation soil were studied. The most obvious was to replace it with good/ inert soil. But it was costly. The other options were to stabilise the soil by sand drains, or lime piles or by mixing it with granular fraction.

5.2 The lime pile technique was used to treat marine clay sub-soil in Vashi Node. The lime piles are provided by drilling holes at suitable interval and filling them with unhydrated lime mixed with sand and then pouring water. The lime stabilises the surrounding soil. After sub-soil of roads were treated with lime piles there was no problem of pot holes, The road mainly catered for light car traffic.

5.3 The use of lime piles proved to be inadequate for the Taloja -Kalamboli link road. The traffic – multi-axle container & other heavy vehicles - made the difference. The traffic on Vashi road was predominantly consisted of light vehicles. On the link road layers of Dense Bitumen Macadam & Bitumen Macadam used to be damaged in every monsoon despite provision of lime piles. The inter-layer tension used to separate the layers. In monsoon, the granular layer below Lean Bituminous Macadam used to be saturated and weakened resulting in reduction in its

virtual resilient modulus which in turn created tension in top LBM, BM, and DBM layers that resulted in peeling of layers. Thus there the deterioration traveled from bottom to top. The link road was finally concreted

5.4 The Palm Beach Marg in Navi Mumbai was provided with state of art foundation by stabilising marine clay sub soil by providing sand drains and in some stretches where the marine clay depth was less, by replacing the clay with murrum. The conventional crust - IRC - was provided at top. Though the crust was designed for commercial heavy vehicles, the movement of heavy vehicles was not allowed on the road. The road served its designed life without development of potholes.

5.5 The Sion-Panvel expressway which runs parallel to Palm Beach Marg, mostly aligned on good sub soil varying from hard murrum to soft rock. The crust was designed as per Maharashtra PWD norms. The road was open to heavy traffic of multi axle vehicles. Though having good foundation, the road used to be full of potholes every monsoon. The road used to be repaired by adding one BM layer after every monsoon.. Ultimately the road was concreted. Thereafter it performed well.

5.6 Initially Thane-Turbhe road in Navi Mumbai was having bituminous pavement. The road developed lot of pot holes in monsoon. The road then was concreted. At some locations the cracks reappeared. The investigation revealed that the cracks were located at the positions where water movement under the pavement was noticed. The locations near culverts – at the edges of channels, moving ground water caused leaching of fines from sub-grade resulted in reduction of bearing capacity of sub-grade which developed tensile stresses in concrete beyond limiting stresses. The cracks were also developed where granular layer was unable to provide virtual resilient modulus.

5.7 In case of peripheral road in Kalamboli Ware-housing complex initially asphalt pavement was provided. The road developed potholes in very first monsoon. At the simultaneous occurrence of high tide and high intensity precipitation, the water level observed was at road surface. The underlying soil was marine clay. Taking clue from experience at other sites, it was decided to provide geo cell confinement to granular layer. In one stretch Bamboo Reinforcement was provided. In other stretch geo cells made out of nylon fishing nets were provided with the aim of improving virtual resilience modulus of granular layer. The roads were serving ware housing area and hence used by heavy vehicles. The weight of vehicles and the tyre pressure were checked. It was found to be 100T and 125 psi respectively. After 3years it was found the tension generated completely damaged the bamboo reinforcement and snapped nylon geo cell walls. In this case soil was not stabilised.

5.8 In Dronagiri warehousing complex—where heavy vehicles were expected and the area was below high water level. There the subgrade was stabilised to a depth of 3 to 4 m by lime piles against total depth of marine clay layer of 6 to 8 m. Then the road with bituminous crust of conventional -

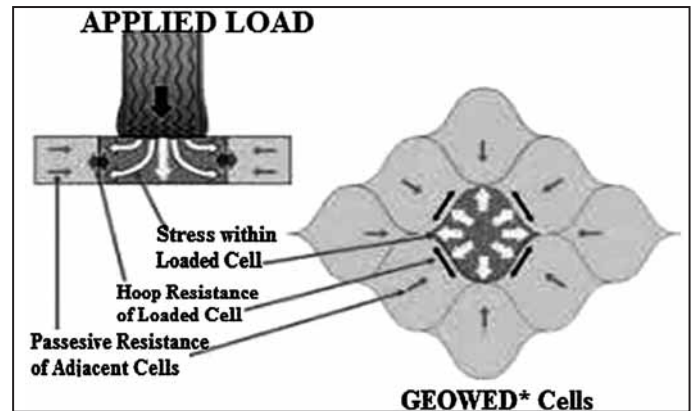


Fig.3 Pavement Confinement with Geo-Cells Formed with Geogrids & Nylon Nets

IRC—design provided, After 3 -4 years, the roads developed potholes in the monsoon after opening for multi axle container traffic. Thereafter geo-cell was tried. The Geo-cell imparts confining pressure and pre compresses the aggregate ahead of application of wheel load as shown in **Fig 3**.

5.9 In Nerul the lime mixed concrete granular sub-base was provided so as not to be disturbed by water. For Vashi – Koparkhairane part of the road was provided CNS layer of aluminium slag and part road was provided CNS layer of stabilised murrum. All the above roads are carrying light weight vehicle traffic and their performance is satisfactory. These experimentation prove that for light car traffic, it will be sufficient to have strong foundation and conventional IRC crust (sub – base & base). But this will be insufficient for heavy loads specially when crust gets fully or partially submerged. Such roads will have to be designed by using different mechanistic model.

5.10 In Mumbai, approach road for one of flyovers was located on marine clay marsh. The pavement designed could not be constructed because of marsh. The crust material used to go down into the marsh. Then geo-cells were provided. The pavement was completed thereafter and served without potholes.

5.11 In construction of Concrete Apron for Airbus 380 at Nagpur, Maharashtra Airport Development Corporation (MADC) provided sub-grade of CNS layer above deep black cotton soil sub soil. The CNS layer was developed by in situ mixing of black cotton soil with lime and flyash instead of replacing black cotton soil with murrum. The decision to use stabilized in situ

soil was taken because the investigation revealed that murrum from some of quarries also exhibits expansive properties. The performance of the Apron is satisfactory.

6 LESSONS FROM ABOVE TRIALS

6.1 Water, Marshy/Expansive Sub-soils, Constantly increasing capacity of vehicles and constant increase in tyre pressure are causing considerable reduction in pavement design life in flexible as well as rigid pavements.

6.2 Introducing rigid base and sub-bases is not a solution.

6.3 Introduction of more flexible base and sub-base to resist increasing traffic load, water saturation of pavement and dealing with expansive sub-soil can be only solution.

6.4 The nylon/ HDPE reinforcement can offer a solution.

7 SUGGESTIONS FOR PREVENTION OF POTHOLES

The above experimentation suggests that potholes formation can be avoid by:

- i. Ensuring proper drainage under the pavement as per IRC provision. This may not be possible in Cities.
- ii. Restriction the wheel loads suitably when the roads are inundated. This will also not possible. This provision is made in some of Euro Codes. But this also is not feasible in Cities.
- iii. Develop design of each layer based on Virtual Resilient Modulus. The first layer of such pavement will be of thick high Modulus Bituminous Concrete as per figure 4 to the specifications of IRC-116. The layer should suitably reduce the imposed load so that the layer below can bear it without cracking. The bottom of bituminous layer shall be impervious to water and should prevent entry of accidental pumping of water from intersection of bituminous layer and granular layer. If due to saturation, the granular layer below loses its bearing capacity, then the upheaval of granular layer due to load be prevented by stiff top layer. Under this condition tensile crack at the top should be restricted so as not to admit water from top.
- iv. The base layer should be of granular material suitably reinforced by Nylon/HDPE geo-grids to offer confining pressure to granular material so as not to allow disturbance in the layer due to traffic on the pavement.
- v. The sub-base layer should provide the stability to granular layer. The stability required for granular layer is for ensuring its free movement to achieve required Virtual Resilient Model and prevent pumping of sub-soil and sub-grade particle into base and reduce inter-particle friction. In case of loss of inter particle friction of granular particles due to saturation a suitable geo grid reinforcement in the form of geo-grid or geo-cell can be introduced.

- vi. Sub-grade should be a layer of suitably stabilized sub-soil mainly to contain expansion of sub-soils and prevention of pumping of sub-soil particles into sub-base.
- vii. It is possible to develop equipment for in field measurement of Virtual Resilient Modulus by developing suitable equipment and instrumentation.

8 CONCLUSION

Modeling and designing flexible pavement based on three layered model designed on the basis of Virtual Resilience Modulus can increase the pavement life and can ensure pothole free pavement. The top layer has to be of high modulus asphaltic layer to take the heavy wheel load and limit settlement & upheaval for comfortable ride. The second layer has to be of confined granular material which can have virtual resilient modulus to restore strain created by moving wheel load. The foundation layer shall have strength to support incidental penetration of load. It should also offer resistance to slippage of sub-base granular material. The analytical model for Virtual Resilient Modulus based on inter-particle friction and traffic movement can be worked out and cross checked by suitable field experimentation.

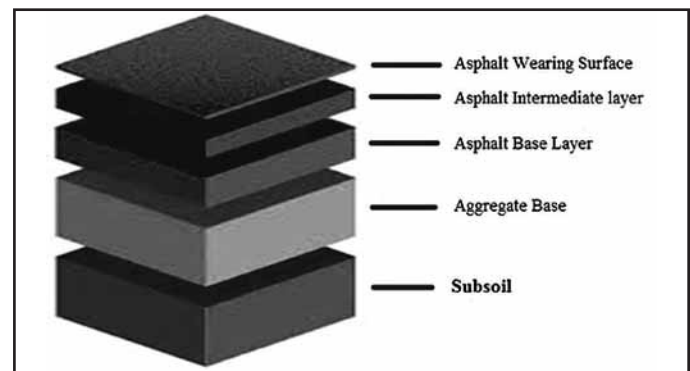


Fig. 4 Typical three Layer Flexible Pavement Model –Google Image

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File No. RW/NH-33044/18/2020-S&R (P&B)

Government of India

Ministry of Road Transport & Highways

(S&R Zone)

No.1, Parliament Street, Transport Bhavan, New Delhi-110001

Dated: 14th December, 2020

Subject: Use of New/alternative Material and Technology in construction of Highways

Madam/Sir,

It is felt necessary to consolidate various instructions of MoRTH, codal provisions and guidelines regarding cost effective new/alternative Material and Technology in highway construction to reduce construction cost.

2. IRC guidelines are available for use of Cement Treated Base (CTB), Cement Treated Sub-base (CTSB), Waste Plastic, Geo-Synthetics, Recycling, Fly-ash, modified Bitumen (CRMB, Polymer modified, Natural Rubber), Soil stabilization, etc. in highway construction. It is necessary to promote these materials/technologies in construction and maintenance of National Highways for harnessing potential time and cost savings.

3. The details of these material/technology and relevant IRC Guidelines/MoRT&H circulars are summarized at Annexure-I:

4. IRC has also accredited new materials/techniques/equipment/products. These may also be used as per the above Code/Guidelines/Circulars. The details of accredited material/technology are available on IRC website.

5. The standard EPC document issued by Ministry on 05.03.2019 specifies Defects Liability Period ranging from 3 to 10 years for development and maintenance work, depending on the type of pavement, standalone bridge/tunnel, new/alternate material/technology used etc. Ministry's circular No. RW/NH-33044/10/2002/S&R (P&B) dated 21.08.2018 had also specified Defects Liability Period of 10 years for the stretches where new technology/material has been used/ is proposed to be used.

6. As per Article 10.2 of the model document for EPC contract agreement, it is the responsibility of Authority's Engineer to review and approve the design and drawing prepared and submitted by contractor.

7. All ROs of Ministry/NHAI/NHIDCL & CEs of BRO are requested to use (i) new/alternative Material and Technology and (ii) locally available materials which are suitable and cheaply available in the area in Highway construction for better quality of construction, sustainability and cost and time savings.

8. DPR consultant shall furnish life cycle project cost comparison amongst the options using conventional material/ technologies & with the use of new/alternative Material and Technology based on rate analysis as per Standard Data Book of the Ministry/ market rate. DPR approving authority should ensure that such comparison has been done by the DPR Consultant and the new/alternative Material and Technology proposed by the DPR consultant is cost effective as well as environment friendly.

8.1 Bidding of the project will be taken up considering the cost determined by DPR consultant based on conventional material/ technologies or new/alternative Material and Technology which is most economical to the Authority. It will not bar the contractor/concessionaire to use other new/alternate material/technology. The decision of use of appropriate material/technology will rest with the contractor/concessionaire subject to satisfactory compliance to the provisions of this circular.

8.2 In case use of such new/alternate material/technology by the contractor/concessionaire brings down the cost of construction/maintenance, provided it meets all other design/construction provisions as envisaged in the contract and stipulated in the Codes, Standards, Specifications, Guidelines etc. specified under schedule D, the Authority shall not revise the contract price nor ask the contractor to transfer the cost reduction benefit to the Authority.

8.3 It is clarified that any new alternate, material & technology that has been accredited by IRC, and falling under IRC:SP-89 (Part 11), will not require further accreditation, and will henceforth fall under approved, alternate, material and technologies. For such approved, alternate, material and technologies, the Defect Liability Period shall be at par with conventional /flexible pavement.

9. "It is clarified that the material/ technology for which Codes, Standards, Specifications, Guidelines etc. of IRC, MoRTH, AASHTO, ASTM, Euro Code and British Codes are available shall not be treated as new/ alternate material/technology and, as such, Defects Liability Period (DLP) of projects using such material/technology shall not fall into the category corresponding to new material/technology. Hence the defect liability period will be at par with conventional/flexible pavement. The stretches where new material/ technology is used for which Codes, Standards, Specifications, Guidelines etc. of IRC, MoRTH, AASHTO, ASTM, Euro Code and British Codes, FHWA guidelines are not available, the project may be taken up on pilot basis and the Defects Liability Period of such projects shall be 10 years."

10. No separate approval from the Authority is required for using new/ alternate Material/ technology within the contract provisions. The Authority's Engineer/ Independent Engineer shall also approve the design and drawing of all the new/ alternate Materials proposed by contractor/ concessionaire for which international standards such as AASHTO, ASTM, Euro Code and British Codes, FHWA guidelines are available.

11. If the use of alternative material/technology is not specifically covered in the Indian or International Standards as mentioned para 9 above, contractor/ concessionaire would be permitted its use on certification by owners of similar projects regarding the continued successful performance of such materials, technologies, methods, procedures or processes for design life of the project as per Para 1.9 of Manual of two laning/ four laning/ six laning of IRC. In this regard, it is hereby clarified that usage in Indian condition shall not be insisted by the Authority's Engineer/ Independent Engineer for the Material/ Technology if certification by owners of similar projects regarding the continued successful performance of such materials are confirmed. The contractor/concessionaire will however be required to submit all quality assurance and quality control documents and demonstrate to the satisfaction of Authority's Engineer/ Independent Engineer satisfactory performance of the pavement or structure using

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such material or technology. Authority may seek performance of the use of such material and technology through appropriate diplomatic channels. However, Defects Liability Period of such projects shall be 3 to 10 years (Varying subject to specific technologies) and approval shall be accorded at the level of Regional Officers or equivalent officers on recommendation of Authority's Engineer/ Independent Engineer.

12. IRC:SP:112-2017 "Manual for Quality Control in Road and Bridge works" and various IRC Codes/MoRTH guidelines prescribe specifications and standards for design and construction of various proprietary items such as Geosynthetics. Contractor/concessionaire will ensure that the design parameters, warranty and other requirements are fulfilled by manufacturer(s) of such proprietary items as specified in applicable standards/guidelines. In addition, the contractor/concessionaire has to comply the documentation requirements from manufacturer/self, test on proprietary items as specified in IRC:SP:112-2017 "Manual for Quality Control in Road and Bridge works" and applicable standards/guidelines.

13. ROs/EDs of Ministry/NHAI/NHIDCL & CEs of BRO (Kerala, Karnataka, Tamil Nadu, Puducherry, Andhra Pradesh) shall implement projects involving coir technology and ROs of Ministry/NHAI/NHIDCL & CEs of BRO (West Bengal, Odisha) shall invariably consider using jute technology wherever appropriate. A monthly report shall be submitted by all this ROs/EDs.

14. All ROs of Ministry/NHAI/NHIDCL & CEs of BRO are requested to submit quarterly reports indicating the number of projects and quantity of New/Alternative material used by them to the Ministry.

15. The contents of this circular may be brought to notice of all.

Yours faithfully,


(Jagat Narayan)

Superintending Engineer (S&R Zone)
For Director General (RD) & SS

Annexure-I

S No.	Material/ Technology	Applications	IRC Code/Guidelines/ IS Code	MoRT&H Circular
1.	Waste Plastic	Wearing Coat	IRC:SP-98 "Guidelines for the use of Waste Plastic in Hot Bituminous Mixes (Dry Process) in Wearing Courses".	i. Circular No RW/NH-33044/24/2015-S&R (R) dated 26.11.2019 "Use of Waste Plastic in hot bituminous mixes in wearing courses (dry process) for construction of National Highways"; ii. Circular No. RW/NH-33044/24/2015-S&R (R) dated 27.08.2019 "Collection and Re-use of Waste

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				<p>Plastics: Swachhata hi Seva Campaign”;</p> <p>iii. Circular No. RW-NH-33044/24/2015-S&R (R)dated 27.12.2016 and 09.11.2015 “Use of Plastic Waste in bituminous mixes in construction of National Highways”.</p>
2.	Cement Treated Granular Layer	In Base (CTB); In Sub-base (CTSB)	IRC:37 “Guidelines for the Design of Flexible Pavements”.	-
3.	Geo-Synthetics	<ul style="list-style-type: none"> i. Reinforcement in pavement ii. Slope-Protection iii. Separation, Filtration, Drainage and erosion control iv. Impermeable barrier/capillary cut off in waterlogged areas v. Stress relieving membranes and crack retarding layer. 	<ul style="list-style-type: none"> i. IRC:SP:59 Guidelines for Use of Geo-synthetics in Road Pavements and Associated Works”; ii. IRC:113 “Guidelines for the Design and Construction of Geo-synthetic Reinforced Embankments on Soft Sub-soils”. iii. IRC:SP:48 “Hill Road Manual” iv. IRC:56 “Recommend 	<p>Circular No. 33044/64/2018-S&R (P&B)dated 16.07.2018 “Geo-Synthetics and their use in road construction”.</p>

			<p>ed Practices for Treatment of Embankment and Roadside Slopes for Erosion control”</p> <p>v. IRC:SP:106 “Engineering Guidelines on Landslide Mitigation for Indian Roads”</p>	
4.	Recycling	<p>i. Wearing Coat</p> <p>ii. Crust building</p>	<p>IRC:120 “Recommended Practice for Recycling of Bituminous Pavements”.</p>	<p>i. Circular No. RW/NH-33044/10/2002/S&R (R) dated 11.01.2018 “Guidelines for implementation of Hot in place Recycling technology for Periodic Renewal (PR) works”;</p> <p>ii. Circular No. RW-22012/01/2012-Mechdated 18.12.2012 “Use of Recycling technology for PR (Periodic Renewal) works on National Highways”.</p>
5.	Fly-ash	<p>i. Embankment</p> <p>ii. Cement Concrete</p> <p>iii. Stabilization</p>	<p>i. IRC:SP:58 “Guidelines for Use of Fly Ash in Road Embankments”;</p>	<p>i. Circular No. RW/NH-33044/01/2019-S&R (P&B)dated 23.10.2020</p>

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			<p>ii. IRC:44 "Guidelines for Cement Concrete Mix Design for Pavements";</p> <p>iii. IRC:SP:89 "Guidelines for Soil and Granular Material Stabilization Using Cement, Lime and Fly Ash".</p>	<p>"Use of Fly-ash in road/flyover embankment construction on NH works";</p> <p>ii. Circular No. RW/NH-35014/20/2017-H dated 07.01.2019 "MoU for off-take of Fly-ash from private power stations";</p> <p>iii. Circular No. 24028/14/2018-H dated 27.08.2018"U se of Fly-ash in road/flyover embankments construction".</p>
6.	modified Bitumen (CRMB, Polymer modified, Natural Rubber)	Wearing Coat	<p>i. IRC:SP:53 "Guidelines on Use of Modified Bitumen in Road Construction";</p> <p>ii. IRC:SP:107 "Guidelines for Gap Graded Wearing Course with Rubberised Bitumen- (Bitumen Rubber)".</p>	<p>i. Circular No. RW/NH-35072/05/2018-S&R (P&B) dated 24.08.2018"U se of Bitumen & Modified Bitumen in the construction of flexible pavements and their source of their procurement for National Highways Work";</p> <p>ii. Circular No. RW/NH-33044/05/2016/S&R (R)dated 05.09.2016 and</p>

				<p>28.03.2016 "Use of polymer/rubber modified bitumen on NHs and other centrally sponsored schemes";</p> <p>iii. Circular No. RW/NH-33044/49/2015/S&R (R) dated 18.02.2016 "Use of polymer/rubber modified bitumen on NHs and other centrally sponsored schemes";</p> <p>iv. Circular No. RW/NH-33041/3/2001-S&R(R) dated 30.01.2012 "Use of bitumen/modified bitumen for National Highway Works";</p> <p>v. Circular No. 33041/3/2001-S&R (R) dated 19.07.2011 "Use of Modified Bitumen in BM/DBM layers for National Highway Works".</p>
7.	Soil stabilization	Chemical Stabilization	IRC:SP-89 (Part II) "Guidelines for the Design of Stabilized	.

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			Pavements (Part-II)".	
8.	Jute	Slope Stabilization	IRC: 56 "Recommended Practices for Treatment of Embankment and Roadside Slopes for Erosion Control"	-
9.	Coir	Slope Stabilization	IRC: 56 "Recommended Practices for Treatment of Embankment and Roadside Slopes for Erosion Control"	-
10.	Construction & Demolition Waste	i. Embankment ii. Granular Layer in flexible pavement iii. Concrete Pavement	IRC:121 "Guidelines for Use of Construction and Demolition Waste in Road Sector"	-
11.	Recycled Aggregate/Slag Aggregate/Bottom Fly Ash	i. Concrete ii. Granular Layer	IS:383 "Coarse and Fine Aggregate for Concrete Specifications"	Circular No. RW/NH-34066/09/2017-S&R(B) dated 21.07.2020 "Use of Manufactured Aggregates in National Highway Works".
12.	Stone Matrix Asphalt	Wearing Coat	IRC:SP:79 "Tentative Specifications for Stone Matrix Asphalt"	Circular No. RW/NH-35072/05/2018-S&R(P&B) dated 24.08.2018 on "Use of Bitumen & Modified bitumen in the construction of flexible pavements and source of their procurement for National Highways works"
13.	Fibre reinforced concrete pavement	Road crust	IRC:SP:46 "Guidelines for Design and Construction of Fibre Reinforced Concrete"	-

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			Pavements”	
14.	Cold Mix Technologies	Wearing Coat	IRC:SP-100 “ Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion”	-
15.	Open Graded Friction Courses	Wearing Coat for high rainfall areas	IRC-129 “Specifications for Open-Graded Friction Course”	-
16.	Thin White Topping	Wearing Coat	IRC:SP:76 “Guidelines for Conventional and Thin White-topping”	-
17.	Precast Prestensioned girders for bridges, Integral Bridges	Bridges	IRC:SP:71 “Guidelines for Design and Construction of Precast Prestensioned Girders for Bridges”	-

File No.RW/G-23012/01/2019-W&A(Pt.III)

**Government of India
Ministry of Road Transport & Highways
(Planning Zone)**

Transport Bhawan, 1, Parliament Street, New Delhi - 110001

Dated the 15th January, 2021.

Subject: - Contract Document for Short Term maintenance of NHs - Reg.

Ref: - Ministry's letter of even no. dated 23.11.2020.

Sir,

Please refer to the Standard Operating Procedure (SOP) for PR / IRQP works and OR works for Maintenance & Repair (M&R) of NHs issued vide letter under reference.

2. The Contract Document for Short Term maintenance of NHs for one year shall be based on the modifications to IRC:SP:124-2019 (Model Contract for Maintenance of Roads (Based on Single Percentage Rate)) enclosed herewith with immediate effect and until further orders. The Short term maintenance contracts shall be awarded on NH stretches requiring only minor repairs (such as pothole and patch repairs, etc.) and on which improvement / PR / IRQP works may be done within next two (2) year period.

3. Implementation of immediate restoration works for Flood Damages, etc., on the stretches of NHs, on which maintenance contracts have already been assigned, may be got executed as a variation to such ongoing contracts under OR (DPP) as per inter-se priority and availability of allocations subject to prior approval of overall enhancement of such ceilings of works and annual phasing of expenditures for the State. Allocations for such works may not be made under FDR(N).

4. This issues with the concurrence of Finance Wing vide U.O. No. Note #17, dated 31.12.2020 and approval of Competent Authority.

Enclosure: As above


 (A Maulik)
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MoRT&H CIRCULAR

File No.RW/NH-33044/24/2020-S&R (P&B)

Government of India

Ministry of Road Transport & Highways
(S&R-Quality Control Cell)

No.1, Parliament Street, Transport Bhavan, New Delhi-110001

Dated: 6th January, 2021

Subject: Policy guidelines on action against the consultancy firm and key personnel for misrepresentation of facts & fraudulent practices and non-performance.

Reference: MoRTH letter Nos. RW/3901/30/2015-P&P (Pt-I) dated 15.02.2019

Madam/Sir,

Ministry of Road Transport & Highways, vide above referred letter had circulated Request for Proposal (RFP) document for appointment of consultancy services for preparation of DPR, Authority's Engineer and Independent Engineer in respect of National Highways and centrally sponsored works.

2. The RFP document inter-alia requires submission of detail information of each Key Personnel in the specified CV format by the Constancy firm for general qualification, adequacy for the Project and years with the firm, which also include position held in various assignments alongwith total experience against the requirements specified in TOR for the respective key position. The RFP further prescribes following penal action if the information furnished in the CV is incorrect:

(i) If any information is found incorrect, at any stage, action including termination and debarment from future projects of MoRTH or its Executing Agencies upto 2 years may be taken by MoRTH or its Executing Agencies on the personnel and the firm.

(ii) In case CV of a person is turned out to be fake/incorrect/inflated during the assignment, the consultancy firms shall have to refund the salary and perks drawn including interest @12% per annum in respect of the person apart from other consequences. In addition to above, 10% of the salary and perks to be refunded shall be recovered from the Firm as penalty.

3. The above matter has been re-examined in MoRTH subsequent to representation received from Association of Consultancy firms and following have been decided:

(i) If any information is found incorrect/fake/inflated in the CV, at any stage, debarment of the key personnel from future MoRTH or its Executing Agencies projects upto 2 years may be taken by MoRTH or its Executing Agencies.

(ii) In case, the information contained in the CV for the duration in which the key personnel was employed by the firm, proposing his candidature is found incorrect/fake/inflated at any stage, action including termination of the consultancy agreement and debarment of the firm upto 2 years from future MoRTH or its Executing Agencies projects shall be taken by MoRTH or its Executing Agencies.

(iii) In case, the information contained in the CV for the duration in which the key personnel was employed by the firm proposing his candidature is found incorrect/fake/inflated at any stage, the consultancy firms shall have to refund the salary and perks drawn in respect of the person apart from other consequences.

(iv) In case, the information contained in the CV for the duration in which the key personnel was not employed by the firm proposing his candidature is found incorrect/fake/inflated at any stage, the consultancy firms will have to refund the twice of salary and perks drawn in respect of the person.

The above modification, henceforth, shall be incorporated in RFP document by replacing respective portion of (A) clause 3.4.X (a) / (b) / (c) and 3.4.X (g) of Section 2 (Letter of Invitation) & clause 9 of Section 7 [Draft form of contract] for appointment of Authority's Engineer/ Independent Engineer and (B) clause 3.2.4 (i) of Letter of Invitation for appointment of DPR consultant.

4. Furthermore, it has been decided to penalize the consultant for some other defaults which are not stipulated in the RFP/ Contact Agreement, as per following:

Type of default	Action against Consulting Firm	Addition of clause in RFP document
Consultancy Firm's experience/ document is found to be false at any stage i.e. from bidding to completion of services.	The Consultancy contract shall be terminated and consultant firm shall be debarred for a period of 2 years.	New clause 3.4.xiii to be added: In case, consultant Firm's experience/ document is found to be false at any stage i.e. from bidding to completion of services, the Consultancy contract shall be terminated and consultant firm shall be debarred for a period of 2 years.
Ownership of equipment in case of Consultancy/Associate Firm is found to be false.	(i) The consultancy/ Associate firm, as the case may be, shall put on holiday listing (temporary debarment) for a period upto 12 months.	New Foot note to 'Data Sheet' sub criteria Clause for experience in use of technology shall be added: C. In case, Ownership document of equipment of Consultancy/Associate Firm is found to be false, i) The consultancy/ Associate firm, as the case may be, shall be put on holiday listing (temporary debarment) for a period upto 12 months.

5. The marks for equipment is rationalized and full score be accorded for either of ownership or hire purchase or other option such as leasing as the intent of contract is to get the services of the Consultant for using the equipment for the given assignment.

6. In addition, it is felt necessary to streamline the procedure on the part of both i.e. Consultant as well as Employer for effective performance of various obligations under the Contract and Terms of Reference (ToR), as under:

(i) There has been general delay in approval of replacement of key personnel particularly Team Leader, which is examined at various officers at field level as well as HQ. In order to minimize the delay in approval of such replacements, Consultant shall submit the proposal directly to the competent level responsible for such approvals. The approval for replacement of key personnel shall be accorded within one month of submission of such proposal. In case of further delay, unless refused after due evaluation of CV by the Authority within a month, it will be considered deemed approval of such replacements proposed.

(ii) It has been observed in some of the cases that completion certificate of the project is being issued by Authority's Engineer with retrospective effect and without ascertaining that all the works have been completed as per Specification and Standards, particularly ancillary items like shoulders, road signs, markings, road furniture items etc. Issuance of such completion certificate, besides being a fraudulent activity, leads to financial implication such as payment of Bonus even when the works are not fully completed. Ministry has earlier issued guidelines vide letter dated 22.03.2019 on issuance of completion certificate and further Ministry vide letter dated 25.02.2020 has mandated to upload NSV survey report/ data before issuing completion certificate on PMIS portal. Therefore, the test results on completion including video, NSV survey report/ data and safety audit shall invariably be uploaded on the PMIS portal before issue of completion certificate by the Authority's Engineer after ascertaining that all pre-requisites as per Contract Agreement has been fulfilled by the Contractor, failing which Consultancy firm shall be **debarred for a period of two year.**

(iii) In some cases, it is found that MPR are not being prepared properly by the Consultant to reflect the actual progress, hindrances, deployment of resources by the contractor, quality control, Non-conformity reports, safety, fulfilment of obligations of contractor and consultant including approval of various documents, design & drawings. Therefore, it has been decided that Consultant shall record all aspects as per services to be provided in terms of Reference (ToR), failing which the Consultancy firm shall be warned for non-performance. In case Consultancy firm continues to default, even after multiple warning exceeding 5 times, the firm shall be put on holiday listing (temporary debarment) for a period upto 12 months from future assignments by MoRTH or its Executing Agencies.

(iv) In case, person permanently employed with the firm is to be replaced, Technical score of both the CVs shall be compared excluding the marks given for employment with firm. Replacement would be allowed when the Technical Score (excluding the marks given for employment with firm) of the new key person is equal or better than the existing key person's Technical Score **excluding marks assigned for permanent employment with the firm.** However, the remuneration of such replacement shall be reduced on proportionate basis in case the overall score of the replacement person is less than the overall score of original person.

7. Following provision shall be incorporated in the RFP documents regarding selection of consultants:

(i) For project involving high complex/downstream consequences/ specialized assignments, i.e. Standalone major Bridges/ Elevated structures, Tunnels, Expressways, a technical weightage of 80/20 may be adopted for selection of Consultants under QCBS.

(ii) For project of Moderate complexity, i.e. projects of widening to 2/4 laning, a weightage of 75/25 may be adopted for selection of Consultants under QCBS.

(iii) Provision of Additional Bank Guarantee from selected bidder for low bids is dispensed with.

(iv) In case final DPR and 3D has been submitted and no further action is taken by the employer, the DPR shall be considered as completed after 3 yr and submission of both final DPR and 3D.

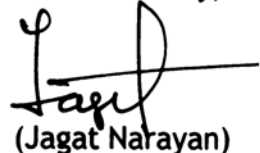
8. MoRT&H and all its implementing agencies will incorporate the provision of this circular appropriately to the RFP of DPR consultant/ Authority's Engineer/Independent Engineer before inviting proposals for a particular consultancy services.

9. Any complaint/ default which comes to the notice shall be examined by concerned Regional Officer and proposal will be submitted to Hars with his specific recommendation and documentary evidence. The Committee comprising of Zonal Chief Engineer, an Officer of the rank of SE from other Zone and a representative of IFD will further examine the case and give an opportunity to the Consultant for submission of his clarification. After carefully examining the matter with due diligence, the Committee will recommend deterrent action for acceptance of competent authority. NHAI and NHIDCL will create similar mechanism to deal with the complaint/default.

10. Contents of this circular may be brought to the notice of all concerned for immediate compliance.

11. This has been issued with the approval of the Competent Authority.

Yours faithfully,



(Jagat Narayan)
Superintending Engineer (S&R) Roads
For Director General (RD) & SS

MoRT&H CIRCULAR

File No.RW/G-23012/01/2019-W&A(Pt.III)

Government of India
Ministry of Road Transport & Highways
(Planning Zone)
Transport Bhawan, 1, Parliament Street, New Delhi - 110001

Dated the 15th January, 2021.

Sub: - Contract Document for Medium Term maintenance of NHs - Reg.

Ref: - Ministry's letter of even no. dated 23.11.2020.

Sir,

Please refer to the Standard Operating Procedure (SOP) for PR / IRQP works and OR works for Maintenance & Repair (M&R) of NHs issued vide letter under reference.

2. The Contract Document for Medium Term maintenance of NHs for at least three years shall be based on the modifications to IRC:SP:124-2019 (Model Contract for Maintenance of Roads (Based on Single Percentage Rate)) enclosed at Annexure-I with immediate effect and until further orders.

3. Implementation of immediate restoration works for Flood Damages, etc., on the stretches of NHs, on which maintenance contracts have already been assigned, may be got executed as a variation to such ongoing contracts under OR (DPP) as per inter-se priority and availability of allocations subject to prior approval of overall enhancement of such ceilings of works and annual phasing of expenditures for the State. Allocations for such works may not be made under FDR(N).

4. Considering that medium term maintenance contracts shall be awarded on NH stretches requiring only minor repairs (such as pothole and patch repairs, etc.) and on which improvement / PR / IRQP works may not be done within next three (3) year period, incident management (viz. route patrols, ambulances, tow away vehicles, etc.) should also be part of the contract. However, such provisions shall be made for NHs stretches (either in contiguity or separated by 20 km maximum on the same NH or different NHs) of at least 60 km or more; suitable bundling of sections of same / different NHs may accordingly be made. In case it is not feasible to bundle NHs sections to suit the requirements, provisions for incident management may be deleted with specific prior approval of Competent Authority.

5. Incident management shall be coordinated through Control centres/ Telephone operators managed through IHMCL, for which separate SOP shall be issued.

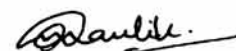
6. Criteria for estimation of rates & quantity of usage of Road Survey using Network Survey Vehicle (NSV) and Bridge Inspection using Mobile Bridge Inspection Unit (MBIU) (wherever considered necessary) have been enclosed at Annexure-II for guidance purpose for invitation of bids.

7. Guiding principles for bridge inspection is enclosed at Annexure-III.

8. Specifications of standard NSV is enclosed at Annexure-IV.

9. This issues with the concurrence of Finance Wing vide U.O. No. Note #17, dated 31.12.2020 and approval of Competent Authority.

Enclosure: As above



(A Maulik)
Executive Engineer (Planning)
planningmorth@gmail.com

Note :- Above Circular & its Enclosures are available on MoRT&H Website : www.morth.nic.in

TENDER NOTICE



Government of Karnataka
Public Works Department, National Highways

Office of the Executive Engineer, National Highway Division, Q-1, APMC Yard Shimoga,
Email : cenhdsmg@gmail.com. Phone No 08182 -251772

No.: EE/NHD/SMG/AE-1/NIT-15/PR/NH766C/2020-21 / 1699 **Dated:** 18-01-2021

SHORT TERM TENDER NOTIFICATION UNDER CENTRAL E-PORTAL

Tender is invited from the qualified bidders for the following works under
Email: eenhdsmg@gmail.com Central e-portal.

Sl. No.	Name of work	Amount put to tender (Including all Taxes) Rs In Lakhs	Bid Security /EMD. Rs. In lakhs
1	*Road Safety and providing protective works at damaged portion of road (Rigid Pavement) at km 40+200 of NH 766C, Nagodi Ghat adjacent to major tributary to Sharavathi River in the state of Karnataka on item rate Mode (Job No:NH-766C-KNT-2020-21-916) (KW-4)	376.21	5.65

Publishing Date : 20-01-2021 at 4.00 PM

Last Date & Time for receipt of tenders : 04-02-2021 at 4.00 PM

Date & Time for Opening of Tenders : 05-02-2021 at 4.00 PM

Further details can be had from the office of the Executive Engineer, National Highway Division, Shimoga, and in Government Website: www.eprocure.gov.in

Executive Engineer
National Highways Division
Shimoga

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- Mobile LiDAR System (Vehicle Mounted)
- Falling Weight Deflectometer (FWD)
- Ground penetrating radar (GPR)
- Retroreflectometer (RR)
- Automatic Traffic Counter & Classifier (ATCC)
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Dr. L.N. Malviya Chairman cum Managing Director Inspecting the Features of NSV with LCMS, LiDAR, MBIU & FWD

Contact can be made with us at our office address, Telephone & Mobile Nos. as below:

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E mail: contact@lninfra.com, Web.: www.lninfra.com

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Mobile No.: 9977828711 (Dr. L.N. Malviya)



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Sectors



Services

SA Infrastructure synchronizes every aspect of engineering with imbibed commitment to deliver high quality infrastructure and development consultation that glorifies a new world. We have successfully carried out numerous consultancy projects in Civil infrastructure development, transportation, primary & secondary highway networks, Project Management under BOT/Annuity Model, Resource Management, Social aspects including poverty alleviation and Institutional support.

Highways : Including Access Controlled Expressway and upgradation of existing 2/4 Lanes.

Bridges : Including VUP, Flyovers, rehabilitation, ROB and Inspection Report and Conditional Survey.

Metro-Rail Services : Including design of underground and elevated metro stations, viaducts, architect design of stations and technical services.

Traffic & Transportation and intelligent Transport System - including preparation of Urban and Regional Transportation Plans, Land-use Transport Modeling for Policy Testing and Traffic Predictions, Traffic Management Plans, Road Safety Audit, Public Transport Planning and Management.

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Water Resources including Irrigation Flood Control, Ground water exploration, Environmental and Social Aspects.

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