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Transportation Infrastructure Role of Civil Engineer

Vikhyat Negi[1], Dr. Pardeep Kumar Gupta[2]
[1]*M. Tech, Transportation Engineering Punjab Engineering College, Deemed to be University, Chandigarh, India*

Abstract: ***The pressure of development on cities is increasing in India, as elsewhere in the world, with the rising urban population and growth of urban areas. The development of cities in itself is dependent upon the public infrastructure services. In this study an attempt has been made to show the major roles played by transport engineers in the development of transport infrastructure in Himachal Pradesh (India). Modern, reliable and sustainable public infrastructure is critically important to the country, and to Indians. Our public infrastructure helps connect communities, drives our economy and keeps us healthy and safe. This study critically reviews the domain of transportation infrastructure projects and role of transportation engineers in planning, designing, construction, maintenance, rehabilitation, up-gradation and various other possibilities. The study discusses the problem of cost overrun, time overruns and many times the lack of employing appropriate number of civil engineers on an infrastructure project. In order to overcome these hurdles a relation between requirement of number of engineers in transportation projects and project characteristics has been developed.***

I. INTRODUCTION

Civil engineers play a major role in the infrastructure development of a country. All transportation infrastructures constructed in the past exhibit the path of civilization and current infrastructures development express the practices followed by transportation engineers. Infrastructure can be defined as activities that provide society with services necessary to conduct daily life and to engage in productive activity and development in a country's economy. Infrastructure is a system of services and communication that is required for the overall development of the society. It refers to facilities such as transportation (i.e. Railways, Highways, Air ways, Water ways etc.,), hospitals, education, energy (coal, electricity, oil etc.), irrigation, farm equipments& machineries, science and technology, communication, health & hygiene, banking that facilitate and contribute in the process of production of goods and services for the overall development of the economy of the society. The infrastructure is of two types.

a) Economic infrastructure: It contributes directly to the economic development of any country. It consists of transport and communication, power supply, irrigation networks, financial institutions etc. b) Social infrastructure: It contributes to the process of economic development of any country indirectly. It consists of education & training, health & family welfare, housing & water supply and other civic amenities.

II. RESEARCH METHODOLOGY

1) Comprehensive literature survey of the existing technical journals and various project reports in order to list the important components of infrastructure development - roads, bridges, airports, dockyards, railways, ropeways etc.

2) Extensive and comprehensive literature survey from the various government publications, annual reports, project reports have been carried out in order to determine the role of civil engineer in transport infrastructure development.

3) From this detailed and extensive literature survey a data source focusing on highway construction projects will be established which would help studying the factors such as cost of project, nature of project and variation in the work-force involved in the completion of projects.

4) To undertake a case study for specific identification of different stakeholders roles in the construction and that of civil engineer in particular in a road construction project.

5) Apart from the literature survey, analysis of the various road projects under State Highways and Major District Roads in the region of Himachal Pradesh was performed to form a framework for predicting the requirement of number of civil engineers in a project.

III. DATA COLLECTION

Overall Expenditure on Majaor District Roads and State Highways in Himachal Pradesh		
Zone wise expenditure in SH and MDR in Himachal Pradesh		
TYPE OF PROJECT	Estimated Cost In Millions (INR)	Actual Cost In Millions (INR)
HP-MDR	670.03	706.07
HP-SH	667.19	733.15
HP-MDR	8428.42	9657.19
OVERALL EXPENDITURE	9765.64	11096.41

Investment That Could Be Monitored by an Individual Engineer Staff .

S.No	OVERALL INVESTMENT (Million INR)	TOTAL NUMBER OF REGULAR ENGINEERS IN HPPWD	INVESTMENT TO BE MONITERED BY EACH (ENGINEER) Million INR
1	9765.64	1894	5.15

IV. DATA CALCULATIONS

1) Case Study on Project: Construction of Kharihar to Lingerbansu Road

Project: Road Construction of Kharihar to Lingerbansu in Himachal Pradesh
Type: 11km Stretch of Major District Road (All the geometrics are as per IRC)
Supervised by: Himachal Pradesh Public Works Department
Contract value: 38.5 Million INR
Contract duration: 29 months (2.5 years)

2) Project Category and Multiplier

a) This type of project is under the category of 'roads and drainage' and the subcategory is road construction with moderate structural element.

b) Depending upon Annexure II, the labour multiplier which is average labour requirement in man-day/Million INR is computed to be 525 for road construction with moderate structural element.

3) Calculation of average core cash flow per year (as per Guideline for Estimation of Manpower Requirements arising from Public Works Revision: June 2012)

The average core cash flow per year = contract value / (0.9 x contract period) in years
= 38.5/ (0.9 x 2.5 yrs)
= 17.11 Million INR

4) Calculation of Labour Requirement In Man-Day Per Year

Labour requirement in man-day per year =
(Average Core Cash Flow Per Year) x (Corresponding Multiplier)
=17.11 x 525= 8983.33 ~ 8984
= 8984 Man-Day (Annual Basis)

5) . Conversion of labour man-days to no. of labour per year

Taking 1 man-year = 295 man-days,
No. of labour per year = labour man-days / 295
= 8984 / 295 = 30.45 ~31

No. of labour required per year = 31 Labours.

6) Calculation of no. of Contractor's Staff and Client's Staff per year

For civil engineering projects, the ratios of contractor's staff to labour is taken as 1: 6.6 and client's staff to labour is 1: 12.4 respectively (as per Annexure III).

Number of contractor staff= 31 / 6.6 = 4.69 ~ 5

Number of client's staff = 31 / 12.4 = 2.5 ~ 3

7) Calculation of no. of Professional Staff (Engineers at higher level) and Technical Staff (Engineers at ground level) in Contractor Side and Client side (as per Annexure IV)

a) From Contractor Side

Ratio of professional staff to technical staff is 13 % : 87%

Number of professional staff from contractor side = 5 x 0.13 = 0.47 ~1

Number of technical staff from contractor side = 5 x 0.87 =3.17 ~ 4

b) From Client Side

Ratio of professional staff to technical staff is 22% : 78%

Number of professional staff from client side =3 x 0.22 = 0.66 ~ 1

Number of technical staff from client side = 3 x 0.78 = 2.34 ~ 2

V. CONCLUSION

This study has examined various detailed project reports of road construction in the region of Himachal Pradesh. The one of the perspective was emphasized on the number of civil engineers required for the successful completion the project. It has also shown the various roles and responsibilities which are been shared and executed by the civil engineers in different stages of an infrastructure project.

The practice of employing the right numbers of civil engineers allows to deliver a quality infrastructure and which is the need of the hour for any country. This helps in improving the economic stability of the country as infrastructure sector serves as the backbone of any country's economy. It minimizes the overhead expenditure which might occur in any construction project by following wrong practices due to lack of knowledge and employing people which do not belong to the respective field.

It won't be wrong to conclude that Civil Engineers are key to quality infrastructure because they are involved in all aspects of infrastructure. Engineers understand that infrastructure is an investment – an investment in the economic, social and environmental prosperity of this country. As a result, the engineering profession is committed to lifecycle design and an active promoter of sustainability. High quality, reliable infrastructure can only be maintained if engineers and public infrastructure owners understand the full lifecycle needs of their investments, and adopt employing skilled, responsible civil engineers. Good asset management – which includes engineers and others – allows us to measure the condition and remaining service life of existing infrastructure. It means constant monitoring and planning of transportation, environmental, health and education infrastructure needs. There are many factors to think about: the condition of current infrastructure, future needs, adaptation to climate change, and population growth.

A lifecycle perspective which would be provided by employing standard number of civil engineers in the project, that consistently assesses the condition and performance of infrastructure can save money and improve safety over time. For the lifecycle perspective to work, you need accurate information on the current state of infrastructure, and a consistent set of indicators and processes to assist with long-term planning. By combining technical performance measures – such as the condition and performance of assets – with social, economic, environmental and safety considerations, it's much easier to accurately forecast costs.

Overall, civil engineer's know-how can help governments and infrastructure owners prioritize and assess projects and programs that will help maintain the high standard of infrastructure in our country, and ultimately protect the safety, health and economic prosperity of our nation

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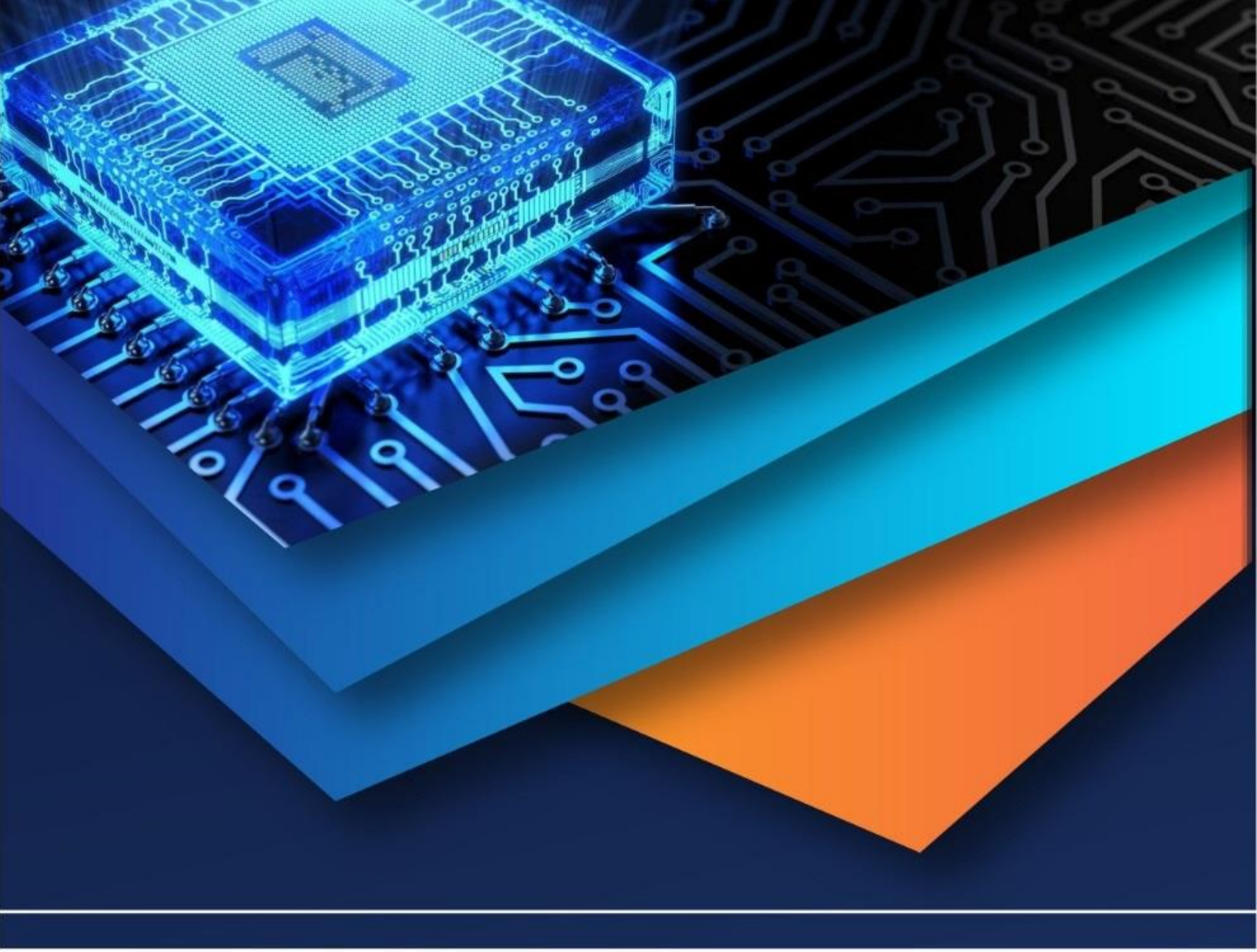

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