

Construction Challenges for Bridges in Hilly Areas

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ABSTRACT: A Bridge is a structure built to span a valley, road, river, body of water, or any other physical obstacle. Designs of Bridges will vary depending upon the function of the bridge and nature of the area where the bridge is to be constructed. The first bridges were made by nature itself—as simple as a log fallen across a stream or stones in the river. The first bridges made by humans were probably spans of cut wooden logs or planks and eventually stones, using a simple support and crossbeam arrangement. Some early Americans used trees or bamboo poles to cross small caverns or wells to get from one place to another. A common form of lashing sticks, logs, and deciduous branches together involved the use of long reeds or other harvested fibres woven together to form a connective rope capable of binding and holding together the materials used in early bridges. Hilly region pose unique problem for bridge construction. In a restricted hilly area itself climatic conditions, geological features and hydrological parameters vary considerably. Keeping in view the bridge site and various constraints, type of bridge and method of construction are to be selected carefully for safe, economical and successful completion of bridge construction.

KEYWORDS: Bridge, Hilly, Construction, Challenges

I. INTRODUCTION

Himalayas have been considered as a vast repository of valuable medicinal herbs, minerals, forest resources etc since the Vedic times. While the Vedic literature followed by the writings of Susruta, Charaks, Nagarjuna, Dhanwantri, Balmiki, Parashar and various other saints, bear statement to it. "Alexander, The Great", who was much influenced because of its scenic beauty, healthy climate and agro climatic conditions, made a great publicity of the Himalayan Herb Science in Yunan and Rome during middle ages. This potential, however, remained unexploited especially in higher reaches due to insufficient means of communication. While after independence, Govt. of India, gave a unique emphasis on road construction in order to bring socio-economic up-liftment of tribal inhabitants. But due to lack of proper planning it resulted in serious ecological imbalances.

Various challenges that come across while constructing bridges in hilly area are

1. Construction of bridge across deep gorges
2. Construction of bridge on rivers with bouldary beds
3. Construction of bridges in extreme temperature zones
4. Construction of bridges on sharp turn on highway
5. Landslide or Debris flow

Deep gorges, rivers with bouldary beds, extremely low temperature condition, high winds, landslide etc. in hilly regions require special attention to complete the activities of bridge planning and construction in a systematic way and are discussed here in.

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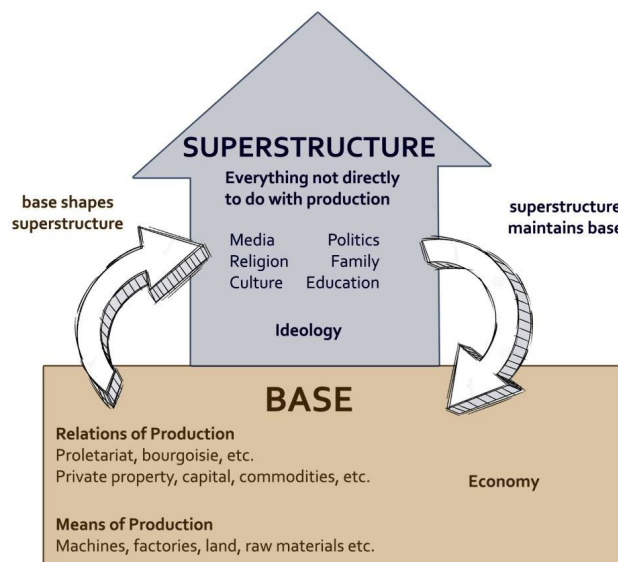
II. BRIDGE FOUNDATION AND SUBSTRUCTURE

Foundation construction for any large bridge takes time and the problems that encounter during the construction of foundation depend upon type of foundation you select, soil strata encountered, equipment and plant deployed and even logistic problems play vital role. While the construction difficulties anticipated during the execution can be kept in view while as planning works for a period for the job. However, foundation can be open foundation, well foundation, pile foundation, or any other types of foundation.

In case of well foundation, the various type of soil are encountered and it becomes difficult to give any clear time schedule about the sinking of wells unless the soil details are very clear and the anticipated profile matched with the actual encountered. In case of bouldery and clayey soil the rate of sinking schedule is likely to be slow when compared with the sandy soil. Also there may be requirement of pneumatic sinking technique subsequent to open grabbing due to difficulties in sinking of well.

As the cost of pneumatic sinking is very high, this should be deployed judiciously. In such cases, there is need to keep the details of all the sinking difficulties in a systematic order and this can be reviewed in consultation with decision making authority.

III. SUPERSTRUCTURE



For particular site there are numerous structural arrangements which need to be look in. Whereas, the final proposal need to be made based on the greater examination of site condition may be technical, aesthetic and construction methodology. However, there should be special care need to be taken in case of deep gorge where there is sizable difference between soffit level and bed level. This may pose difficulties for staging and shuttering. Proposal recommended for site should be well read in advance. After the proposal has been finalized for particular bridge, the construction can be planned. The quantities of each items involved and execution method be listed. Basically method

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statement should be kept ready for overall execution including job estimate. This data will be kept to ensure smooth progress of project.

IV. MANAGEMENT OF CONSTRUCTION ACTIVITIES

Management of bridge construction demands that construction manager to reorient all the resources in such a way that the project is completed without any time/cost overrun. Output of the work depend upon how best the activities are managed which will vary from site to site based on many factors. Based on the experience, various aspects be identified for efficient construction management. Schedule of construction based Critical Path Method (CPM) be prepared along with major milestone and Bar Charts. Latest software management tool can be used for this in case of a major bridge project. Design of Bridge is a post sanction in case of departmental construction and after tendering action in case of bridges throughout contract. It is necessary that design must be preceded by at least six to eight months or say 50% ahead of execution of concerned event. It has to be ensured that this should be completed well in time. Revised design if any should be updated and clarified without delay. Observation on the approved design drawing if any be passed to design office immediately to make the changes. This is most important in case of foundation where design soil parameter needs to be adhered to. These may vary on actual execution and require review of design. To keep details with design office it is necessary that progress of foundation work be well informed to the design office.

V. PLANT MANAGEMENT

Requirement of equipment/plant be assessed systematically and accordingly action may be taken to arrange this for a particular job.

1. Quantum of work covering all the items with specifications
2. Time available for work execution
3. Details of equipment and also minimum requirement as per job position
4. Rated capacity of equipment/ plant
5. Assessed capacity
6. Schedule of maintenance
7. Inventory of spare parts required
8. Repair cover to equipment/plant

The layout should ensure minimum movement of material, equipment and personnel of the area is an essential condition, for operation of some equipment for example tower crane operation not possible at heavy winds speed. Stone crusher if required for site should be suitably located. Supporting facilities such as generator, office, stores should not be located in the path of dust, flow. The service road should be properly maintained. Receipt and dispatch of equipment be kept in proper format to keep of details of its utilization at site.

After staff has reported at site necessary action should be taken to utilize all the equipment. The required facilities for servicing and repair must be established to meet requirements.

Material Management

Material management is a similar activity along with start of the Project. This cover procurement of camp material, office equipment, major purchased items, such as aggregates, sand, cement, steel, structural steel, shuttering consumables, electrical fittings. Forecasting of quantity and cost of various items on monthly basis must be done at least three to six months in advance which should be frequently reviewed.