



## “Implementation of Wide Span U-slab Cast-in-Situ system in Indian Railways.”

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### Abstract: -

India is a country with high population growth and also comes among the highest population having countries. India holds the second position in population rank on the world level with 1,336,286,256 (1.3 billion) people (recorded in May 2016), more than a sixth part of the world's population. India also has a dense network of railways connecting almost parts of the country for business and general purposes. Here in India railway system is divided in four segments which are East central railways, West central railways, North central railways, South central railways. An Indian railway is the most commonly system used for travelling by Indian peoples. With the increase in population Indian railway system also requires to be upgraded for the further enhancement to complete the population needs.



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In India growth rate of development in the railways is increasing at a very faster rate. New and modern techniques are identified and are implemented to support the development of Indian railways. Researchers are devoting their keen interest in railways to have the appropriate and suitable outcome for its development. Vast development can be seen in the railways as a modern transport system. Research and development in any field enables the use of modern methods and ways for its development. For this study a case of existing railway project of third line is considered for this study. This project is in the development stage and it comes under RVNL (Rail Vikas Nigam Limited). RVNL is an Government body taking full care of Indian Railways system. With the overall study of Indian railways an Unit U-Girder system is taken as the main focus of study. The concept of U-shaped bridge girder is now being adopted at a big pace in urban metro rail projects and for substitution of old bridges where there is a constraint on vertical clearance. These bridge decks are commonly designed using simplified methods that assume beam activity of the webs in the longitudinal direction and identical flexural action of the deck slab in the transverse direction. In this study techniques and methods which is suitable for the betterment and improved performance of railway system is used.

**Keywords:** -*U-slab cast in situ, Simplified methods, Indian railway systems.*

### Introduction

At present we are so much used to the Railways department for carrying out logistics of materials and humans. Before 1825, the world was a different world. The origin could be traced back to 1784 when the mail coaches were introduced carrying mails. The horses were pulling the wheeled vehicles on wooden rails that were replaced with iron plates called ‘plate laying’. The horses were replaced with steam engines with the introduction of using coal as energy. The first steam engine was created by Nicholas Joseph Cugnot and was later on



modified by Richard Trivithick and William Murdoch. This modification later on brought about the public railway designed by George Stephenson. The idea of public railway transport spread throughout the world. In India, the railways developed under the patronage of the East India Company, having the first train between Mumbai and Thane, 16th April 1853.

Looking into the advantages of the railway system, it can be broadly classified to economic based, social based, political based. For the economic based, we can consider that it brings about industrial development and growth, employment opportunities, increased mobility of people, stabilization of prices, transportation of food and clothes and increases land value. For social based we can consider aspects like access to religious places, provision of cheap mode of transport and broadening social outlook. For political aspects we could consider unity of different castes, mobilization of troops and equipment during emergencies, easy control of administration and helping for migration of population.

The railways of modern times have to resort to most advanced techniques and measures, if they want to retain their position in future. Some of the techniques are electronic machines devised to control train movements, operate signals, preparing timetables for train, audible operated signal, providing mobile library, providing dining cars, introduction of multi current locomotives, providing television apparatuses at level crossing, crewless freight trains, refrigerator trains carrying food, container service.

## **Methodology**

The research team developed the basic designs to carry out an initial evaluation of the design details with regard to construction and implementation of continuous precast, pre tensioned girders. The design parameters such as the girder type, strand sizes, girder spacing, material properties, etc. were selected such that they are representative of typical bridges in Indian Railways. The concrete strengths at service and at release were limited to values commonly available from railways pre casters. Different design methodologies based on assumptions were evaluated to determine their impact on the final design loads and thermal effects. The potential key design constraints evaluated were as follows.

- Deflection.
- Serviceability stresses under live load and thermal gradient.
- Flexure-shear interaction at supports.
- Shear demand on thin webs plus duct placement.
- Moment demand and ultimate strength.



The Methodology of the work Started with the scheduling of the work of the construction of the 3<sup>rd</sup> line railway bridge. The concept and the reference were taken from the metro rail concept.

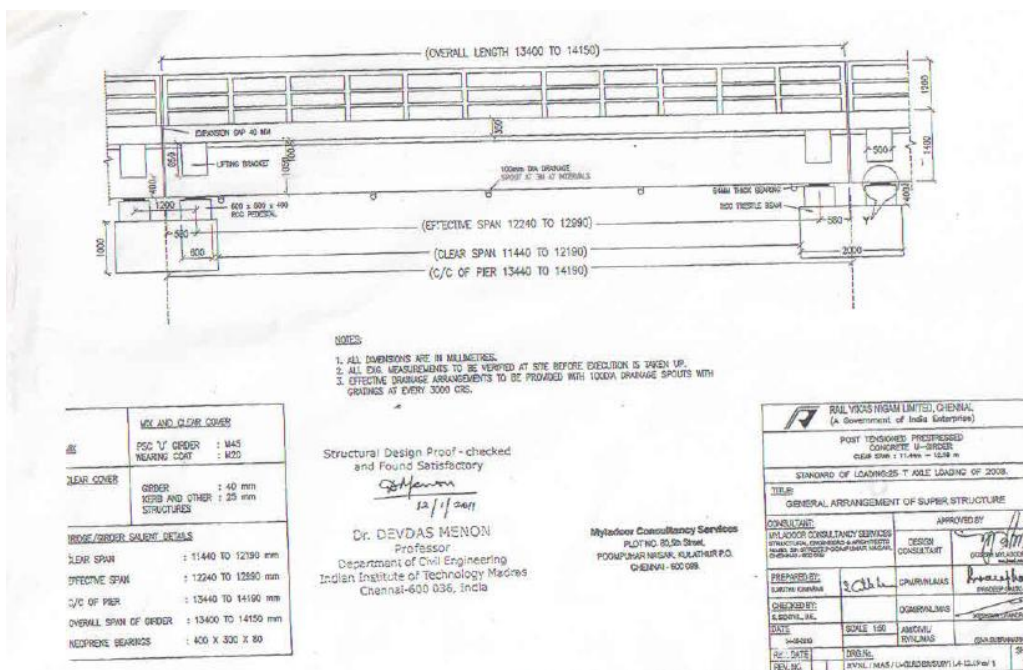
In the metro rail concept such rail bridges are developed and they are performing outstandingly. Taking the same consideration in mind the department of Indian railways are also taking the similar steps to improve the railway bridges performance by implementing in the new projects of Railway. As Delhi metro is the advanced transportation seen in the Delhi now a days with the lesser problems of serviceability there guidelines according to the Indian railway department can be used for betterment.

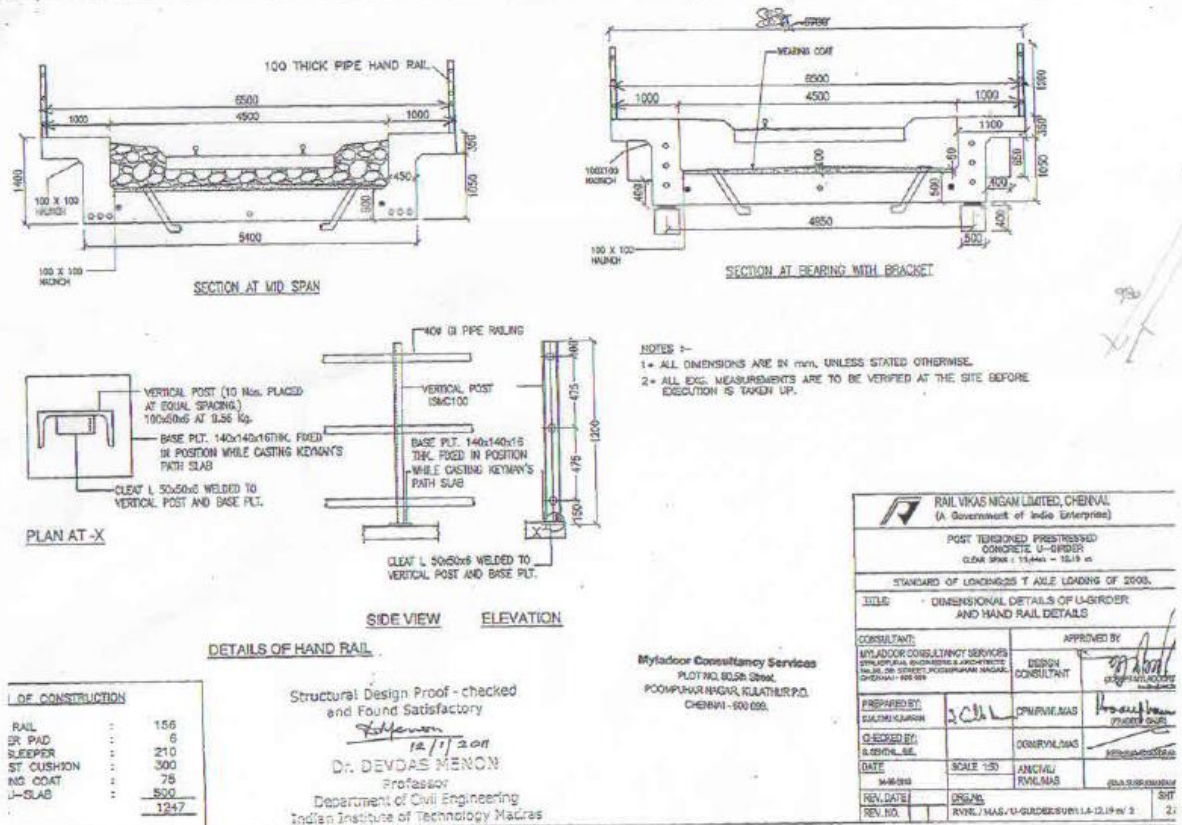
There are basically four types of Slabs used in the railway construction which are mentioned below:

- PSC Slab (U Slab of standard 13.44 Span length)
- Single Bent Slab
- Double Bent Slab
- Steel Girder (Plate Girder)

Among these four types of slabs in the 3<sup>rd</sup> line west central railway project U-Slab Cast-in-situ is used for the construction which comes with various advantages meant for efficient and better rail route system.

U-Slab are the Casted slabs used in the railway construction sites and are stressed and casted at the location without erection method. Below is the image of U-slab Cast-in-Situ





Sectional View of the used U-slab Cast-in-situ for Railway

## Conclusion

In India Delhi Metro Rail system is using the advanced techniques for the comfortable travelling of Indian peoples. Delhi metro rail system uses U-slab system of defined span length for the railway lines and is also showing good performances till now so a similar method can also be used in the Indian railways for new west central railway project of 3<sup>rd</sup> Line railway in Madhya Pradesh.

Cast-in-situ can be better option for the railways and can be further implemented in the other rail route construction.

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