Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 06, June - 2017

Prestressed Concrete Sleepers Importance and Innovation

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***Abstract*—In this paper, Prestressed Concrete Sleepers are discussed briefly and observed various parameters governing the same. It is advantageous in rapid making of the material and in terms of high strength requirements.**

Keywords—Prestressed Concrete Sleepers; Finite Element Modeling

I. INTRODUCTION

Prestressed Concrete Sleepers are designed to resist dynamic form of loading mainly. Freyssinet developed a sleeper with 2mm diameter wires, wound continuously as a thread, and pretensioned by rods passing through the loops at each end. The principle function of the sleepers is to distribute the wheel loads carried by the rails to the ballast. Factors affecting the design of sleepers are a) the static and dynamic loads imposed on rail seats b) the ballast reaction on the sleeper[1].

II. METHODS OF APPLICATION-PRESTRESSING METHODS

The prestressing wire shall be stretched either individually or collectively by an approved method. However, the stretching force shall in no case exceed 75 % of the minimum specified UTS of the wire. The pre-tensioning force in the wire shall be applied by a tensioning device equipped with automatic load cut off unit along with measuring gauge[2].

III. DESIGN ASPECTS

From the consideration of Indian Hume pipe co.ltd. Which is manufacturing company of railway sleepers (prestressed concrete sleepers), the same is advantageous over a) timber sleepers b) post-tensioned monolithic type c) two block sleepers. So nowadays, monolithic type model is being used for Railway Sleepers. The following Table1 depicts different parameters for different set of countries and comparison is made.

TABLE I. DESIGN PARAMETERS

Sleeper	*German*	*British*	*French*	*India*
Length	2.40m	2.51m	2.30m	2.75m
Prestressing	270kN	404kN	300kN	350 kN
Tendons	8/6.9	26/5	20/5	18/3
HTS	5.4kg	10.5kg	7 kg	8.4kg
Weight	235kg	286kg	150kg	282kg
Strength	60	50	50	52.5
Transverse Reinfor	Nil	Nil	Helix	Nil
Method prestres	Pretensioning	Pretensioning	Pretensioning	Pretensioning
Manufacture	Individual Moulds	Long Line	Long Line	Long Line

IV ANALYSIS AND DESIGN

For the prestressed concrete analysis, ANSYS software provides a state of art solutions to analyze the structure. Procedure will be discussed briefly. Boundary Conditions would be set initially, meshes are developed and load should be applied and the bending stressed could be observed using analysis. This comes under finite element analysis of the concrete beam.

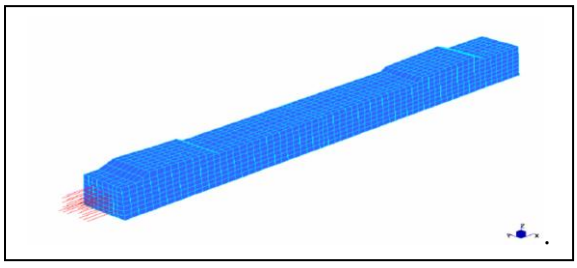

Fig1. Finite Element Modeling

V CONCLUSIONS

It is thereby understood that prestressed concrete sleepers are good in design and execution. So overall, it has to be optimized for better results in terms of economy and safety considerations. In future, research could be given priority for such prestressed concrete sleepers, so it could be used effectively under practical conditions.

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