JAGADAMBHA COLLEGE OF ENGINEERING & TECHNOLOGY, YAVATMAL - 445001

DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to Certify that the dissertation report entitled **"DESIGN OPTIMIZATION AND VIBRATION ANALYSIS OF HEAVY DUTY LEAF SPRING BY USING CAD TOOL"** has been successfully completed by **MR. SHREEVATSA VIVEK BELGAONKAR** under the guidance of **DR. V. L. BHAMBERE** in recognition to the partial fulfillment for the award of the degree of Master of Engineering in Mechanical Engineering at "Jagadambha College of Engineering & Technology, Yavatmal – 445001. (An institution affiliated to Sant Gadge Baba Amravati University, Amravati)

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Abstract

Heavy duty leaf spring set always undergoes large number of loadings and vibrations. Hence the chances of failure of leaf spring set are always maximum. Leafs attached in a set are often breaks while working. Sometimes entire spring set needs to be repaired as more than two leafs is braked. The major cause of failure is road conditions and driving. In India road conditions are not much better; hence the failure of leaf spring set always accurse.

Hence there is a need of design optimization of a leaf spring set also its performance testing. But the cost of entire leaf set is relatively high. Hence we adopted the virtual method of design optimization and its performance testing. Also the vibrations during running of vehicle may affect the durability and effectiveness of leaf sets. Hence the vibrations generated are also needs to be studied well.

In this project the existing front left leaf spring set with three different materials of TATA 1512 Bus is considered to analyze. The CAD model of leaf spring set is generated with the help of CATIA V5R19 Software. Further it is imported into ANSYS Software and structural and vibration analysis are performed for considered three different materials. Based on the results generated design changes will be suggested. Also the best material for leaf spring set manufacturing is proposed. Further conclusion is drawn as per the results generated.

Index Terms- Leaf Spring Set, Virtual Design, CAD Model, Structural Analysis, Vibration Analysis

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This is to certify that the Dissertation report entitled

"PERFORMANCE BASED DESIGN OF SYMMETRICAL AND UNSYMMETRICAL BUILDING"

Is a bonafide work and it is submitted to the Sant Gadge Baba Amravati University, Amravati.

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ABSTRACT

In the past couple of years, India has seen a series of disasters- Uttarakhand, Kashmir, Vishakhapatnam, Bhuj, Chennai and now recently in Manipur as well as Nepal which realize our serious attention towards the safety prevention and protection of life structure from such disaster, which influence further discussion.

A performance-based design is aimed at controlling the structural damage based on precise estimations of proper response parameters. Over the past 25 years there has been a gradual shift from this position with the realization that increasing strength may not enhance safety, nor necessarily reduce damage. The development of capacity design principles in New Zealand in the 1970's (Park and Paulay, 1976) was an expression of the realization that the distribution of strength through a building was more important than the absolute value of the design base shear. It was recognized that a frame building would perform better under seismic attack if it could be assured that plastic hinges would occur in beams rather than in column (weak beam/strong column mechanism), and if the shear strength of members exceeded the shear corresponding to flexural strength. This can be identified as the true start to performance based seismic design, where the overall performance of the building is controlled as a function of the design process. The static pushover analysis is becoming a popular tool for seismic performance evaluation of existing and new structures. The expectation is that the pushover analysis will provide adequate information on seismic demands imposed by the design ground motion on the structural system and its components.

In this present study two R.C buildings, one symmetrical and one unsymmetrical in plan (designed according to IS 456:2000) are analyzed using Pushover Analysis and redesigning by changing the main reinforcement of various frame elements and again analyzing. The pushover analysis has been carried out using SAP2000, a product of Computers and Structures International. Various cases for a particular five storey building located in Zone-IV have been analyzed, changing reinforcement of different structural elements, i.e. Beams and Columns, in different combinations as well as at different storey levels. The results of analysis are compared in terms of base shear, storey drift, spectral acceleration, and spectral displacement and storey displacements.

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