Design & Analysis of Pre-Engineered Building Structure

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Abstract—In the present study pre-engineered building are design and studied in accordance with Kirby technical specification which is based on ASCE-07. Pre-Engineered steel buildings fulfils requirements of industrial steel structures along with reduced time and cost as compared to conventional steel building.

Key words: Manually Design of Pre-Engineered Building Structure, Use Staad Pro software, Estimating of PEB Structure

I. INTRODUCTION

PEB are tailor made buildings which are combination of built up section, hot rolled section, cold formed element and profiled sheets based on clients requirement & actual design calculation using tapered sections. Pre Engineered steel structure building can be fitted with different structural accessories including mezzanine floors, canopies, fascia’s, interior partitions.

Pre Engineered buildings are generally low rise buildings. However the maximum eave height can go up to 25 to 30 m. Low rise buildings rise buildings are ideal for offices, houses, showrooms, shop India fronts etc. Pre Engineered building use a combination of built up sections, hot rolled section and cold formed element which provide the basic steel frame work with a choice of single skin sheeting with added insulation or insulated sandwich panels for roofing and wall cladding. The concept is designed to provide a complete building envelope system which is air tight, energy efficient optimum in weight and cost and, above all, design to fit user requirement like well fitted glove.

India being a country massive house building constructions is taking place in a various part of the country. Since 30% of Indian population lives in towns and cities, hence construction is more than urban places. The requirement of housing is tremendous but there will always be a shortage of house availability as present masonry construction technology cannot develop meet the rising demand every year.

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III. LITERATURE REVIEW

The concept of Pre Engineered building is in recent in industrial structure. This methodology is a versatile not only due to its quality in pre designing and prefabrication, but also due to its light weight and economy. The concept includes the techniques of providing the best possible section according to the optimum requirement. This concept has many advantages over the conventional building. Many papers on compressive study of Pre Engineered building and conventional building concept have been present in past, it is report that PEB structure are more advantageous than CSB structure in terms of cost effectiveness, quality control speed in construction and simplicity in erection.

India being one of the fast growing economies, infrastructure development is inevitable. Thus there is wide scope for pre-engineered buildings in India. Thus PEB is an upcoming field in construction industry in India. Some papers have shown in detail the study of PEB design using IS 800 over AISC. As compared to other countries Indian codes for building design are stringent but safer.

A. PROF. DR. S. SEETHARAMAN (2005)

“Construction Engineering and Management”, Published by “Umesh Publication” - This is based on analysis of PEB and Conventional Building taking case study as a three storied apartment (G+3) which is located Hubli, Karnataka. In this an effort is made to analyze the Pre Engineered building and compare it with conventional structure for cost and other criteria. In super structure columns, beam, walls, flooring, slab, lintel, chajja are analyzed pre-cast members. The planning is done as per requirement and the various activities involved in the construction of this member are considered. The study is carried out using primavera P6 software which is in project Management program.

B. SALEEM M. UMAIR, Q. HISHAM AND ZAHID A. SIDDIQI (2013)

“Optimum unbraced length ratios of slender steel section”. The Pre Engineered building is having many advantages over conventional steel buildings. Many authors have studied about benefits of PEB over CSB but there is lack of study about PEB itself. It is fact that there are variations in use of steel quantity with using different type of PEBs like regular, mono slope and curved frame PEB. For this the analysis has carried out by taking optimized section for loads and load combinations calculated by excel sheet, considering DL, LL & WL, with the combination according to IS 800: 2007. The analysis has done through the software ANSYS which is based on FEM. Stresses have found for design load and the stress ratio of the support frame has found with quantity of steel and compare with each other for deriving economic type of PEB. One typical frame has also take for deriving which stress in predominant for failure.

C. SAI KIRAN GONE, RAO KAILASH, RAMANCHARLA PRADEEP KUMAR (2014)

“Comparison of Design Procedures of PEB”: The Pre Engineered building is having many advantages over conventional steel buildings. Many authors have studied about benefits of PEB over CSB but there is lack of study about PEB itself. It is fact that there are variations in use of
steel quantity with using different type of PEBs like regular, mono slope and curved frame PEB. For this the analysis has carried out by taking optimized section for loads and load combinations calculated by excel sheet, considering DL, LL & WL, with the combination according to IS 800: 2007. The analysis has done through the software ANSYS which is based on FEM. Stresses have found for design load and the stress ratio of the support frame has found with quantity of steel and compare with each other for deriving economic type of PEB. One typical frame has also take for deriving which stress in predominant for failure.

D. PROF. LANDE P.S. , KUCHERIYA VIVEK V. (2015) "COMPARATIVE STUDY OF PRE ENGINEERD BUILDING WITH CONVENTIONAL STEEL BUILDING”

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E. Design and Analysis of Pre-Engineered Building Structure.

<table>
<thead>
<tr>
<th>Sr no</th>
<th>DESIGN PARAMETERS</th>
<th>SIZE OF SECTIONS</th>
<th>REFERENCE</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Purlin</td>
<td>ISA 150mm X 150mm X 18 mm</td>
<td>IS800-2007 and IS875(II,II) - 1987</td>
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<tr>
<td>2</td>
<td>Principle Rafter</td>
<td>ISWB600@ 145.7kg</td>
<td>IS800-2007</td>
</tr>
<tr>
<td>3</td>
<td>Sag rod/Ridge rod</td>
<td>10mm diameter steel rod</td>
<td>IS800-2007</td>
</tr>
<tr>
<td>4</td>
<td>Column/Column Base</td>
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<td>IS800-2007</td>
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</table>

F. Estimating

<table>
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<tr>
<td>2</td>
<td>Principle rafter</td>
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<td>Purlin</td>
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IV. CONCLUSIONS

PEB concept has been very successful and well established in North America, Australia and is presently expanding in U.K. and European countries. PEB construction is 30 to 40% faster than masonry construction. PEB building provide good insulation effect and would be highly suitable for a tropical country like India. PEB is ideal for construction in remote and hilly areas.

REFERENCES