Efficiency of Pre Engineered Steel Buildings & Conventional Steel Buildings

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Abstract— In recent years, the concept of Pre-Engineered Building (PEB) has helped Engineers in optimizing cost and time. In this study, an industrial ware house of length 60.13m, width 29.648m, with clear height 6.096m and having Roof -Slope1:10 has been modeled , analyzed and designed by selecting built-up tapered section made up of various thicknesses in mode-1 and standard Indian sections like ISMB in model-2.

Keywords: Pre-Engineered Building (PEB), STAAD Pro. V8i (Series-6)

I. INTRODUCTION

Frames of Pre-Engineered buildings (PEB) are made from standard plates stocked by PEB manufacturer. PEB frames are normally tapered and often have flanges and webs of variable thickness. Frame geometry matches the internal stress diagram like bending moment and thus minimizing the material waste and reducing the total cost of the building.

On the other hand, in conventional steel buildings, mill produced hot rolled sections (Column & Beam) are used. Size of the section is selected as per the maximum internal stresses in the beam and column and section is of same size throughout its length. However, in some places, bending moment is minimum but same section is used even in that section although there is no need of such section in that place. In given below image, however shaded portion of section is not required in steel member but it is provided in conventional steel member. Hence, it increase the cost.

II. METHODOLOGY

In recent years, the concept of Conventional Steel Building has helped Engineers in optimizing cost and time. Analysis has been done as per the Indian Standard IS-800:1984, IS-800:2007, IS-875(Part-2), IS-875(Part-3), IS-1893:2002(Part-1). Software tool for 3-d analysis of structure has been done with STAAD Pro. V8i (Series-6).

STAAD Pro can make use of various forms of analysis from the traditional static analysis to more recent analysis methods like p-delta analysis, geometric non-linear analysis, Pushover analysis (Static-Non Linear Analysis) or a buckling analysis. It can also make use of various forms of dynamic analysis methods from time history analysis to response spectrum analysis. The response spectrum analysis feature is supported for both user defined spectra as well as a number of international code specified spectra.

III. MODELING AND ANALYSIS

Model and Material which are used is presented in this section.

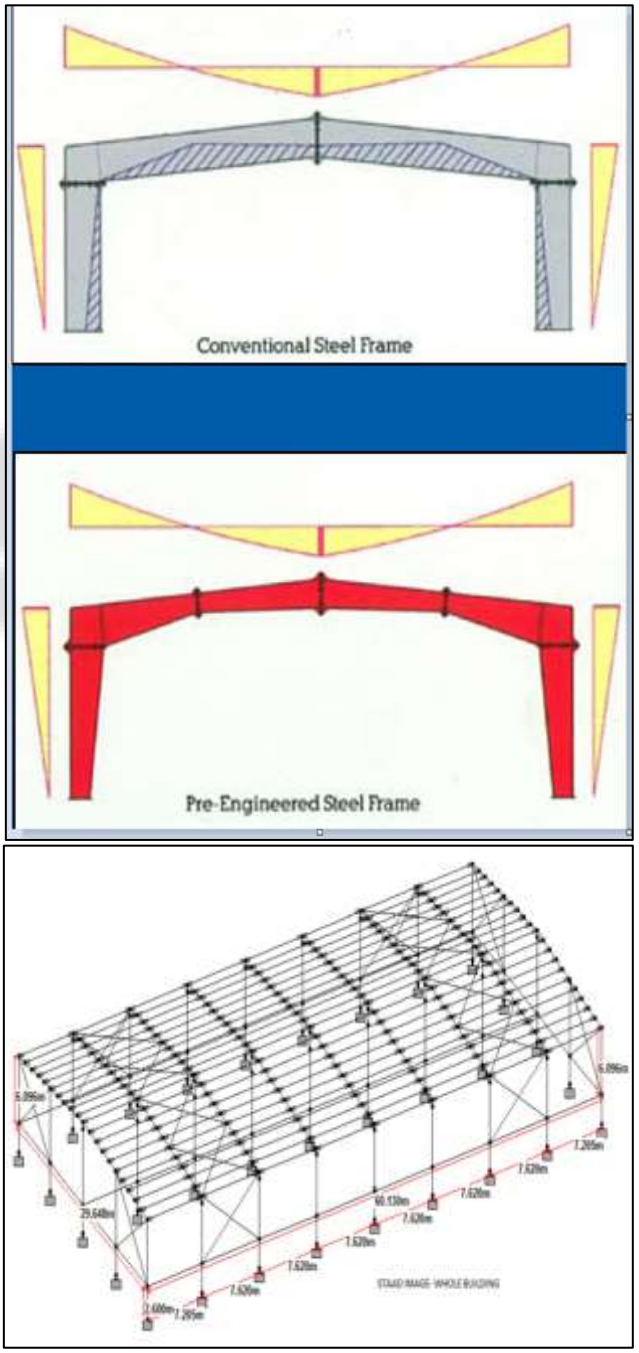

Fig. 1: Staad pro image of building

IV. RESULTS AND DISCUSSION

A. Weight Summary of PEB Building in STAAD (STAAD Output Result)

PROFILE LENGTH (METE) WEIGHT (KN)
431. 438 441 449 451 578 TO 580 583 TO 585 588 TO 590 593 TO 595 598 TO 600 603 -
432. 604 TO 605 626 629 632 635 638 641 644 647 650 653 656 659 662 673 TO 700 -
433. 731 733 741 743 751 753 761 763
Tapered Member No: 1 66.59 26.805
Tapered Member No: 2 85.34 58.402
Tapered Member No: 20 52.67 19.291
Tapered Member No: 97 59.57 37.836
Tapered Member No: 99 42.00 28.328
Tapered Member No: 673 119.00 61.979
Tapered Member No: 674 47.50 46.302

TOTAL = 278.943 KN or 27.8 MT

B. Weight Summary of Conventional Building in STAAD (STAAD Output Result)

PROFILE LENGTH (METE) WEIGHT (KN)
598. 438 441 449 451 578 TO 580 583 TO 585 588 TO 590 593 TO 595 598 TO 600 603 -
599. 604 TO 605 626 629 632 635 638 641 644 647 650 653 656 659 662 805 TO 930 -
600. 1057 TO 1060 1066 TO 1069 1086 TO 1095 1124 1126 1128 1130 1133 1135 1137 -
601. 1139 1142 1144 1147 1149 1151 1153 1155 1157 1159 1161 1203 TO 1259 1262
ST ISMB300 66.59 30.028
ST ISMB600 85.34 100.964
ST ISMB400 52.67 31.761
ST ISMB450 313.00 221.930

TOTAL = 384.682 KN or 38.4 MT
Total weight of structural steel used in PEB building =27.8 MT
Total weight of structural steel used in Conventional steel building =38.4MT
% age saving = (38.4-27.8)/27.8x100=38.1, say 38 %

Hence, in this comparative study of steel used in PEB and conventional steel building, it is found that the steel can be saved up to 39 %.

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