SEISMIC ANALYSIS OF COLD FORMED INDUSTRIAL SHED USING SOFTWARE

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Abstract - *The concept of cold-formed light steel (CFS) framing construction has been widespread after understanding its structural behaviour and characteristics through massive research works over the years. Application, manufacturing, design, and optimization of cold-formed steel structures continue to see significant improvements and refinements. . The concept has many advantages over the Conventional Steel Building (CBS) concept of Building with roof truss. In recent years, the introduction of Pre Engineered Building (PEB) concept in the design of structures has helped in optimizing the design. The adoptability of PEB in the place of Conventional Steel Building (CSB) design concept resulted in many advantages, including economy and easier fabrication. Long Span, Column free structures are the most essential in any type of industrial structures. Pre Engineered Buildings (PEB) fulfill this requirement along with reduced time and cost as compared to conventional structures Cold-formed steel has been widely used for components and main force resisting systems in commercial, industrial, and residential buildings.*

Cold formed structure are designed for the seismic zones with the help of STAAD PRO software.

Key Words: *cold formed steel, STAAD PRO.*

1. INTRODUCTION

The scientific-sounding term pre-engineered building came into being in the 1960s. Typically, a Pre-building is a metal building that consists of light gauge metal standing seam roof panels on steels purlins spanning between rigid frames it has a much greater vertical and horizontal rise building which are ideals for offices, houses, showrooms, shop fronts etc. An Industrial Warehouse is a storage building and is usually characterized as single storey steel structures with or without mezzanine floors. The enclosures of these structures may be brick masonry, concrete walls or GI sheet coverings. These buildings are low rise steel structures characterized by low height, lack of interior floor, walls, and partitions. The roofing system for such a building is a truss with roof covering. The sections are cold-formed from carbon or low alloy steel sheet , strip, plate, or flat bar in cold-rolling machines or by press brake or bending breaks operations. The thicknesses of such member specially range from 0.0149in. (0.378 mm) to about1/4in.(6.35mm) even though steel plate sandbars as thick As 1in.(25.4mm) can be cold-formed into structural shapes.

1.1 Objectives

1. Analysis of industrial ware house of cold formed structure in different seismic zones of India.

2. Calculating the base shear and displacement of the structure in different seismic zones of India.

3. To avoid the damage if any by giving the valuable solution for increase the stiffness and stability of the structure for safe against earthquake.

1.2 Methodology

1. Selection of model configuration for seismic analysis.

2. Analysis of structure with STAAD PRO for all seismic zones of India.

3. Comparative study on results under

i. Relative Deflection

ii. Base shear

2. Significance of seismic analysis of cold formed industrial warehouse.

The seismic analysis of any structure will give the valuable information about the behavior of the structure in seismic time due to it's shock wave .The main purpose of seismic analysis of cold formed structure is to know about it's seismic parameters and stress in the member, to prevent the some amount of the damage of the structural members and one more significance of seismic analysis of structure is to use the seismic result of the structure to design new structure for safe and more earthquake resistant structure.

3. GEOMETRY OF THE BUILDING:

Utility	Cement Godown
Building width	15m
Building length	50m
Height of the column	6m
Height of the truss	2m
c/c dist. Of main frame	5m
Maximum spacing of perlin	1m
Area covered	50m*15m

3.1 SECTIONAL AND MATERIAL PROPERTIES

The sections are used in the warehouse is selected from the IS 801 :1975 specifications for cold formed light gauge steel section For structural member as a beam i.e. top and bottom of perlin are used. Width of top and bottom perlin is 45 mm depth of perlin is 130 mm and length is varies with span of structure thickness Of perlin is 3.15mm.

Members
250CS 80*5
130ZS45*3.15
80LU30*3.15
100CU40*3.15

In all four seismic zones four model will created by using weld joint at perlins and at the joint of truss and column the is bolting connections .

3.2 MODEL IN 3D FORMAT

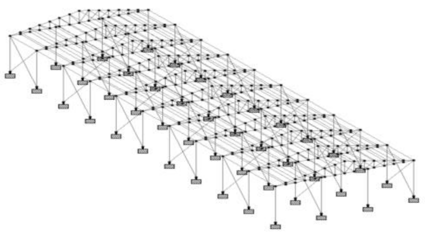

Figure 3.1 3D view of the structure

3.3 Loading condition:

1. Dead load

2. Live load

3. Seismic or earthquake load

4. Load combination

In IS Code 1893 (PART 1) : 2002 for steel plastic design there are load combinations given are as follows as per clause 6.3.1.1

I] 1.7(DL+LL)

II] 1.7(DL±EL)

III] 1.3(DL+LL±EL)

3.4 SEISMIC PARAMETERS:

seismic data	
seismic zone	II, III, IV, V
zone factor	0.10, 0.16, 0.24, 0.36
importance factor	1.75
type of soil	II medium
type of structure	steel structure
damping ratio	5%

3.5 A PPLICATION OF LOAD:

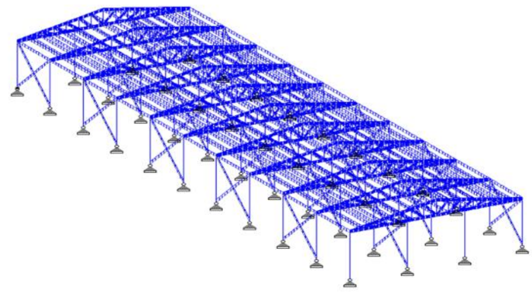

Figure 3.2 dead load application

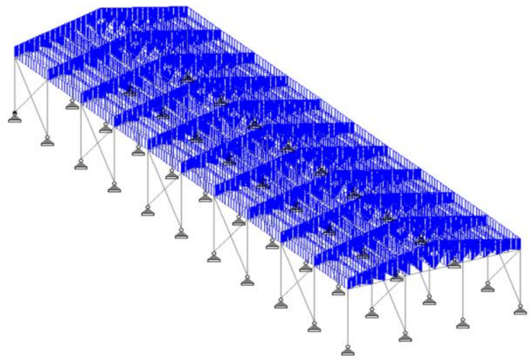

Figure 3.3 Live load application

4. RESULT:

4.1.BASE SHERE:

Base shear is an estimate of the maximum expected lateral force on the base of structure due to seismic activity. It is calculated using the seismic zone, importance of building, soil material and building code .base shear is directly proportional to weight of the structure. Manually calculated base shear of the structure in seismic zone II in z direction is 13.92 KN which is equal to the base shear calculated by STAAD PRO i.e. 13.92 KN.

4.2 DISPLACEMENT:

Displacement is the difference between the initial position of a reference point and any later position. The amount any point affected by an earthquake has moved from where it was before the earthquake. The height of the structure is increased the displacement of the structure is increased from base to top .Generally in any structure displacement at the base is zero. If we goes to the top of the structure displacement of the structure will increase at the time of earthquake.

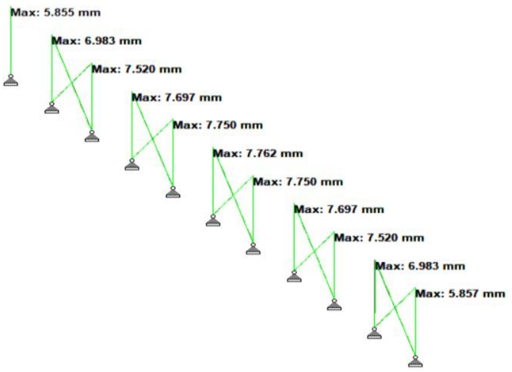

Figure 4.1 Displacement in x direction.

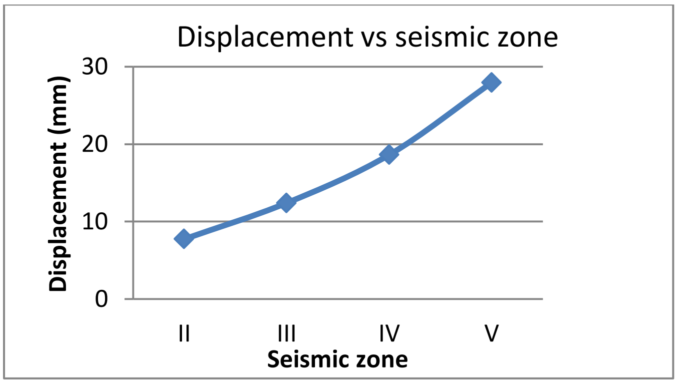

Figure 4.2 displacement (mm) vs seismic zone

5. CONCLUSION

In zone V base shear and displacement of the structure is more as compared to zone II, III and IV and damage of structural member in zone V is more as compared other zones. Zone V is sever for mostly all building as for more height.

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