"ANALYSIS AND DESIGN OF TAPERED WEB PRE-ENGINEERED BUILDING (PEB) STRUCTURE FOR SEISMIC ZONE"

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Abstract—

Using PEB instead of a traditional steel building (CSB) design approach had several advantages, since the members were built using a bending moment diagram, which reduced the amount of material required. This method is adaptable not only because of its high-quality pre-design and prefabrication, but also because it is based on a flexible property due to its light weight, time reducing and low cost. A layer of low lateral stiffness is inserted between the superstructure and the foundation.

This inserted layer in comparison to the fixed base structure, the isolated base structure's fundamental natural time duration is increased. Increases in the fundamental time period may result in a decrease in pseudo acceleration, allowing seismic waves pressures to enter the framework. This method has gained favour in the building industry in recent years. The characterization of the sliding system is utilised to introduce an isolation system, which works by converting shear control at the isolation interface. An earthquake causes ground acceleration and induced lateral loads. To bear the earthquake-induced lateral load As a result, we'll investigate the response spectrum analysis method for both fixed base PEB and Lead Rubber Bearing base isolated PEB.

Keywords—Tapered web Frames, Conventional Steel building (CSB), Pre-engineered building (PEB), Lead Rubber Bearing (LRB), Tools

1.0 INTRODUCTION

PEB is a demand that satisfies the growing demand for large-scale urban growth that is taking place in the region. Preparing for the task at the top of your list enables you to get faster, more trouble-free tasks. Made from high quality materials, these are designed to set standards in the industry. These steel structures are popular for features such as low maintenance, thermal insulation and a wide range of other features that meet the needs of the industry. Contrary to popular belief, these structures are durable. They are quick to install and built to last. Subdivision of buildings is one of the most desirable ways to protect it from earthquakes. It is the basic concepts of seismic engineering that can be defined as separating or disassembling a building from its foundation. These effects in reducing erosion between floors and the successful removal of floors of a single building system ensures minimal damage to facilities and also provides health and property safety. The concept of foundation division has been raised over the last few decades, technologies have been made available, and knowledge of the foundation division system is being used, developed and that is why it is well established. Earthquake isolation systems work best when used in high density, low-rise buildings, due to their ability to change a structural element from solid to flexible. The main objective of our study was to evaluate and compare the behavior of the PEB structure and increase in seismic space using the concept of segmentation, thus reducing story acceleration, story flooding and prolong navigation due to ground excitement, used by installing base isolators lead rubber bear (LRB) at the base level and compare the performance between the fixed base position and the base partition using the Tools.

Pre-Engineered Building Structure components and Structural idea about PEB are shown in figure-1.1

Figure-1.1: PEB Structure

2.0 LITERATURE REVIEW

Now A days costs and construction time are a priority for a client with a large working space for a variety of uses. Mr. Vaibhav Thorat, Mr. Samyak Parekar (21), gives idea about economic losses and minimal material losses, a pre-built building program (PEB) has many advantages, as it offers many columns free space at low cost. Pre-built metal buildings are highly reliable for a variety of uses such as complex industrial areas, warehouses and distribution areas, warehouse, shopping malls, leisure center, car court, office, cabinet, service area, aircraft hanger, athletics and stadium, reading places, temples, hospitals, and any types of industrial buildings. In a pre-built steel construction system, a solid frame consists of a slab. In this study, the industrial structure (factory truss) is analyzed and designed in accordance with Indian standards, IS 800-1984, IS 800-2007. Various loads such as dead, living, wind, earthquakes and loaded ice in accordance with IS codes are considered in the current research related work of the Pre-Engineered Buildings (PEB) and the Conventional Steel Building (CSB). To compare the results of many parametric studies to make variations in terms of total strength, support response, weight correlation and cost evaluation. Pre-built structures (PEB) without bracing are made with two models. Later Pre-Engineered Buildings (PEB) is being analyzed to determine Flexible loads using El-Centro specific ground motion. STAAD Pro in accordance with British standards (BS 5950-1: 2000) and Euro codes (EC3 EN-1993-1) with wind and earthquake analysis. To achieve the above objective of the project, two car showroom models have been constructed namely the British Standard (BS) model and the Euro (EC) code model using STAAD Pro. V Vishnu Sai, P Poluraju and B Venkat Rao (40), contributes for Technological advances have greatly improved the quality of life with new products and services. The Pre-Engineered Building (PEB) is in the midst of such technological advances in building engineering. The PEB concept provides high-quality design, good aesthetic look, quick build quality and reduced suspension time. PEB satisfies a wide range of requirements for custom design and applications. This method of operation is flexible not only because of the high quality of the original design and construction, but also its flexibility. In the present study, comparisons were made on the performance of a multi-port system with different wind turbines [Areas: Vijayawada and Hyderabad]. Analysis and design are done using STAAD.Pro software. The performance of a pre-built structure is assessed by shear force (SF) and bending moment (BM) magnitudes. For Pro analysis, the geometric features of the pre-built sections are determined. The results conclude that the weight of the building found in Vijayawada is 11.04% higher than that of the building in Hyderabad. Shivangi Agrawal, Umesh pendarkar (28), In recent years, the introduction of the Pre-Engineered Building (PEB) design for steel structures has helped to improve the design concept by reducing the dead load of the building. The construction of the PEB in the area of the design concept of the Conventional Steel Building (CSB) has had a very positive effect as members have been designing. The design of the PEB structure as an individual drawing to distribute the bending moment across the entire beam and column lengths and thus reduce the metal requirement with the help of using the IS-stage section. In this study the framework structure of the PEB industry and the standard steel frame are analyzed for air and designed in accordance with Indian standards, IS 800-1984, IS 800-2007 and IS 875 (part 3): 2015. Normal metal structure and Pre-made structure requires rapid construction of buildings as well as good aesthetic appearance and quality construction. A common metal structure and a pre-built structure can be used extensively in the construction of industrial buildings and residential areas. The present paper is designed for the purpose of studying the various research activities involved in the analysis of PEB and the common metal structure.

The current architecture approach requires the best kind of aesthetics, high-quality construction and speed, inexpensive touch and innovation. Balusa Sai Swaroop, Soma Jagadish Sai, Avula Subbarayudu (3) informed that the current architecture approach requires the best kind of aesthetics, high-quality construction and speed, inexpensive touch and innovation. As India is a developing country, large buildings are being built in different parts of the country. In recent years, many India projects have been facing problems of both cost and schedule delays. With 30% of Indians living in cities and towns, construction is high in urban areas. Therefore other building plans such as pre-built steel structures should be considered. The prefabricated structure is a pre-built and pre-built steel structure. Pre-built buildings have many advantages such as design, light construction, longevity, low weight, low pollution, increased productivity, better quality and reduced time and cost compared to traditional buildings. The concept of a prefabricated building consists of a complete factory design and parts of the building are brought to the site in a demolition area. These parts have been repaired / attached to the site and raised with the help of cranes. Pre-built buildings are very quick to build and require good quality and quality construction.Ms. Shalaka Patil, Prof. Dr. M. B. Kumthekar (22), The concept is completely flexible not only because of its quality, structure, and light weight but also because of its economical design. Research is achieved on time and cost effectiveness in industrial construction in a previously constructed building. In this case, the industrial shed is constructed (independent members only) using a standard steel bldg. the concept and concept of PEB and the comparative design results of that structure are made in detail. The current work includes a comparative review of Pre-Engineering Buildings (PEB) and Common Steel Structures (CSB). Conventional Steel Building is an old concept that takes a lot of time, quality and a common suspension feature to fix that problem that is being developed by the Early Engineering Concept. Mr. Hitesh Jibhkate, Prof. Dilip L. Budhlani (19), Technology that provides affordable, environmentally friendly, and durable materials. Prior to the introduction of the PEB system in steel construction, the standard steel structure (CSB) method was used, which provided time-consuming and cost-effective design. The CSB is more expensive as it consumes more steel due to the use of a fixed cross-section of the heat-wrapped section across the length of the member. However, only bound connections are provided in the construction site based on the loading result of the built-in section used in PEB. PEB saves time and provides lightweight construction, making it attractive to the CSB when the site height is large and column-free space is required.

Suraj kinase, et.al. (33), Paper based on a comparison of the cost and time of pre-made concrete compared to pre-made concrete (i.e., traditional). The total cost and construction time with a prefabricated concrete plan is less than the time to use locally made concrete. The timing of any construction varies directly with construction costs. The time required to fasten steel, sealing, concrete and the required treatment time will be reduced. So prefabricated structures work better than conventional structures. Tejas Dodiya, Jigar Zala, Darshan Shah (37), the study compared pre-built structures (PEB) with standard steel structures (CSB). Pre-constructed buildings (PEB) and standard steel structures (CSB) were constructed in accordance with IS 800: 2007 in this study. Using STAAD Pro V8i software, comparisons will be made between PEB and CSB programs. In order to analyze the use of materials, I have used other systems and specifications of materials, as well as various lengths (G + 10, G + 20) and widths (3880 mm, 4850 mm). Following PEB findings and CSB architecture studies, it was found that PEB structures use less material. Bhupesh Kumar, Dr. Pankaj Singh and Ravindra Gautam (5), The pre-built steel structure structure offers low cost, strength, durability, design flexibility, flexibility and usability. Steel is the basic material used in the construction of pre-assembled steel. It denies regional sources. It reworks indefinitely, steel is a function that reflects the requirements for sustainable development. Based on the results of the analysis and design of common and pre-existing steel structures, In this Paper it is noted that PEB Cost Analysis as per the Indian code structure of 45.36% and PEB Cost analysis as compliant with the American code structure with a assistance of 50.78% compared to less than the CSB structure Cost Analysis. Lovneesh Sharma, Nileshwar Taak, Pankaj Kumar Mishra (17), Pre-constructed buildings are repaired primarily using the pre-design and construction process. Improvements in architectural engineering include time constraints, cost savings, improved building ethics and high-quality architectural vision. Pre-built structures are becoming an effective replacement for common metal structures in all aspects. It shows the most advanced results when compared to cost, construction time, quality parameters and architecture views. The main objective of the present study was to compare pre-built steel structures with a common metal structure in all aspects.A mechanically constructed structure was then designed and a comparative analysis was made about a common structure with the same structure. The software that was used primarily in the entire design and analysis phase was the Bentley STAAD PRO and it was found that the pre-built structure provides much more stable results compared to conventional steel structures. It was also found that, if the construction work was in line with conventional methods it would be time consuming and costly in all respects, so the use of improved buildings should be implemented as a construction and maintenance cost to pre-engineering buildings. engineering buildings are much smaller than those made of conventional steel.

B. Ravali, P. Poluraju (2), Resistance to buildings against earthquakes plays a major role in the construction industry. The structure must have strength, stability and ductility to accommodate both horizontal and vertical loading. Horizontal loading leads to the production of sway and causes further vibration and erosion. Strength and durability are the two main keys of any building to withstand gravity and side loads. The provision of bracings or dampers in any structure contributes to the stability of the sides. After providing dampers or bracings, the normal system switches to a lateral load resistance system (LLRS). However, this involves a high economy, suitable only for high altitudes, important structures suspected of being affected by lateral load and structures damaged by lateral load. Current work involves raising the appropriate damp type or tightening to control seismic activity in industrial buildings in successive earthquakes III and V V of India. Industrial buildings also attach a heavy load to the deceased as it provides accommodation for the surviving members. Therefore, this is necessary in order to investigate the earthquake response of buildings with various bracing and dampers to control vibration, side movement and erosion. Natural timing, frequency, roof displacement are major parameters considered to consider structural responses. Analysis of the reaction spectrum of a 3D industrial building with concentric bracing and dampers using SAP 2000 and ETABS was performed on this study under a shear basis. Reference Terms: bracings, dampers, horizontal load, lateral removal, reaction spectrum analysis, floor overflow. Muhammad Umair Saleem and Hisham Jahangir Qureshi (23), in this article the functioning of PEB steel frames in relation to the efficient use of steel components and their comparison with conventional steel structures is detailed in this research study. A variety of PEB and CSB steel frames are selected and tested under various loads. The frames are researched using the Finite Element Based Analysis system, and the design is done in accordance with the design guidelines of the American Institute of Steel Construction. The frames are compared based on their weight, side movement (sway), and vertical movement (deviation). The findings clearly show that PEB steel frames are not only an inexpensive option due to their lightweight construction weight, but also work better than CSB frames. Sudhir Singh Bhadoria, Yash Pathak (30), Over the past year, I have learned a lot about technological innovations and how they have improved people's quality of life. Pre-built buildings are just one example of the transformation of the construction industry. Pre-built custom designs are designed to meet the needs of each customer. Traditionally, conventional steel structures have suffered from the problem of overuse of steel and similarly high costs. Using PEBs instead of traditional metal structures is the focus of this paper. PEB members are developed in accordance with the curvature of the steel frame to reduce the use of steel and construction costs. As a result, the article compares several models of PEB spans ranging from 10 meters to 50 meters i.e. 10 to 30 meters to 40 meters and 50 meters respectively of traditional metal structures with a simultaneous structure. Designing and analyzing models for both systems using Staad Pro Software is used to determine which system is the most economical. Concluded that steel used in PEB is approximate 30% gradually decreased that Conventional Steel Building.

Mohammad Delavar, John K. Dickinson, Girma T. Bitsuamlak (18), The adoption and implementation of Building Information Modeling (BIM) remains a challenge for both the public and private sectors. However, studies and reports show a significant increase in the use of BIM and adoption in normal construction activities over the past five years as traditional tools and processes mature. In contrast, the construction of the Pre-Engineered Building (PEB), a special construction program, did not see similar findings in the use and acquisition of BIM. The PEB program provides the most efficient way to build primarily industrial buildings, and it is for this benefit that it has seen increased use over the past decade. This paper discusses the benefits, risks, and challenges involved in using BIM in the PEB industry. The potential benefits and most important challenges of implementing BIM in the PEB industry are assessed using a case study project. Considering the existing static / non-BIM design process of the PEB system, this paper states that a significant number of replacement orders and remodeling costs can be deducted from PEB collaborative projects (including multiple construction instructions) by defining the BIM design and construction process. categories. In conclusion, this paper raises the need for the development of a comprehensive BIM framework; which can be developed for the PEB industry based on the existing BIM framework and processes used in the Advanced Construction industry. Fahid Aslam, et.al; (11), He did the frame analysis against the force of earthquakes. They made a comparison between a standard momentary frame and a special momentary frame. They found that in the case of an earthquake load the metal required for a strong temporary resistance frame is much higher than a special resting frame. They also say that drift is in a relatively normal state compared to a special temporary resistance frame. They found that steel could be saved by 7% on the main frame and 60% to 130% on bracing using a special resting frame. G. Durga Rama Naidu, et.al; (12), Pre-Engineered Buildings (PEB) offer long-term, low-industrial industrial buildings for part time and general building costs. It compares and designs pre-built structures (PEB) with standard steel frames. The construction is designed with Staad Pro software and compared to the traditional version in terms of weight, reducing costs. G. Sai Kiran, A. Kailasa Rao, R. Pradeep Kumar, (2013), In this test, the modern framework (Ware House) is broken and organized by Indian guidelines, IS 800-1984, IS 800- 2007 and moreover by reference to MBMA-96 and AISC-89. In this experiment, a building with a height of 187m, 40m wide, 8m clear and R-Slope 1:10, is considered to be the basis for investigating and designing a 2D frame (Final frame, frame without frame and edge with crayon modules -3). The economy of the building is tested up to its relative weight, between Indian codes (IS800-1984, IS800-2007) and American code (MBMA-96), and between Indian codes (IS800-1984, IS800-2007). Vrushali Bahadure, Prof. R. V. R. K. Prasad (42), The paper includes comparisons between the various configurations of an industrial warehouse. There are different types of industrial sheds. But here we compare the various configurations of industrial sheds, such as a hot folded steel shed like a shed using Howe truss, type A, portal truss etc. This paper will provide us with the appropriate configuration of the industrial warehouse by making and comparing design and analysis. of various configuration of industrial sheds. Industrial warehouse design, using STAAD-Pro 2007. Comparison provides the appropriate configuration which is a valid point of view. It is clear that comparing the three configurations the author concluded that Saw tooth type industrial industrial require less steel compared to the other two. That means it is economically viable. The author also compares the pre-built industrial warehouse with all of the above three and comes to the conclusion of which industrial area is the most economically viable and observant. The volume of the paper does not explain the benefits and advantages of PEB. The conclusion should be elaborated to explain the results and results of the analysis.

Aijaz Ahmad Zende, Prof. A. V. Kulkarni, Aslam Hutagi (1), In his investigation, he found that pre-built buildings (PEB) meet this situation with less time and money than traditional construction. Comparisons of static and flexible analysis and design of Pre-Structured Structures (PEB) and standard steel frames are shown here. The construction is designed with Staad Pro software and compared to the traditional version in terms of weight, reducing costs. The study included three cases. Two examples compare Pre-Engineering Structures (PEB) with conventional steel structures, while the third compares the construction of long-term PEB. Current research designs pre-built structures and standard steel frames to withstand flexible pressures such as wind and earthquakes. Label, metal is something that reflects the needs of sustainable development. Analysis of air and earthquakes was done manually in IS 875 (Part III) - 1987 according to IS 1893 (2002). Artificial steel structures are less expensive and stronger. Jatin D. Thakar, Prof. P.G. Patel, (15), Related Research of a Pre-Metal Metal Structure Various Width of Structure. The previously constructed production area of 25m, 30m, and 40m wide and 6m Eave Height was demolished and designed using Staad Pro.2007 to understand the behavior of the prefabricated structure and to assess the state of the steel economy. value by changing by direct division such as 4.5m, 5.5m, 6.5m, & 7.5m. Configuration is performed based on IS: 800.

Metal yield concerns are expected as 540 Mpa in the P.E.B production house. Test results are viewed for basic response, second phase, second beam, edge-breaking, mid-range removal. The results of the investigation are also viewed on the basis of sub-lines. Syed Firoz, sarath Chandra Kumar B, S.Kanakambara Rao (35), The construction of a pre-fabricated steel construction system offers several advantages over traditional construction of single-storey buildings. It is an effective and efficient method of standard construction. StaadPro design and engineering software packages are currently being used in built-in engineering facilities to generate and manage real-time diverse, data-rich ideas. With steel as a building material, pre-built steel structures can benefit from low cost, strength, durability, flexibility and usability without sacrificing design freedom. Steel is a major component of pre-engineered steel structures as they are versatile. Opposition to local people. The choice of durable industrial materials with a wide range of colors and colors, as well as rapid replacement and reduction of energy consumption are all part of this strategy. It involves making the right choice to comply with an environmental obligation. Since metal can be recycled indefinitely, it is a good indicator of sustainable development. U. D. Dabhade1, et. Al;(39), notes that, a saving of 55.3% is achieved due to the use of a multi-storey steel structure instead of a pre-distributed concrete frame and 14.3% longer than the pre-installed concrete concrete slab. The construction of a two-story steel structure saves time, resulting in a complete saving of total costs. The required direct cost of steel with a composite base structure is 23.10%, which is higher than the pre-distributed concrete frame and only 0.52% higher than steel installed with the pre-concrete frame. Considering the time-saving savings, the total cost required for steel with a low-grade composite frame is 12.99%, above the pre-distributed concrete frame and 2.32% below the pre-distributed concrete frame. A precast concrete roof saves construction time 35.83% than the pre-installed concrete frame, which required 22.70% additional direct cost and 14.96% of total cost. However, research is limited to a structural framework only. If other factors are also considered in the study such as excavation work, finishing materials, services, coverings etc.

3.0 MATERIALS AND METHOD

3.1 METHODOLOGY

- Analysis and modeling Tapered web Pre-Enineered Building structure with fix base and with base isolation technique using Lead Rubber Bearing.
- Study and comparision the seismic parameters such as base shear, storey displacement, overturning moment, storey drift and storey stiffness.

3.2 MODELING AND ANALYSIS

In this effort, software was utilised to assess and create pre-engineered and conventional building structures. In the first case, a 2D plane frame of 84.337 m length, 40 m width, and 7.667 m bay spacing was developed for PEB Structure. This frame allows you to pick the most affordable bay spacing.

3.3 MATERIAL GRADE FE345

3.4 DETAILS OF THE STRUCTURES

- Length , l -**83.487m**
- Width , w -**40.00m**
- Purlin Spacing-**1.50m**
- Bay spacing for centre -**7.667m**
- Bay spacing for gable end-**7.242m**
- Clear eave height , h-**5.00m**
- Max. eave height -**7.00m**
- The depth of foundation below plinth level is 2m.
- Roof slope (θ)-**10.00**

3.5 DEAD LOAD CALCULATIONS FOR PEB STRUCTURE

- Wt. of sheeting , purlins and sag rods -**15.00Kg/m²**
- Dead Load (DL) FOR 7.667 M centre span-**1.15KN/m**
- Dead Load (DL) FOR 7.242 M span(Gable End Span)-**0.54KN/m**

3.6 COLLATERAL LOAD

- Collateral Load on Rafter-**25.00Kg/m²**
- Load due to HVAC , Services , Fire Proofing . Solar Panel etc.
- Dead Load (DL) FOR 7.667 M centre span-**1.92KN/m**
- Dead Load (DL) FOR 7.242 M span(Gable End Span)-**0.91KN/m**

3.7 LIVE LOAD (LL)

- Live load/unit area, roof-**75.00Kg/m²**
- Dead Load (DL) for 7.667 M centre span-**5.75KN/m**
- Dead Load (DL) for 7.242 M span(Gable End Span)-**2.72KN/m**

3.8 DETAILS OF PARAMETERS FOR SEISMIC ANALYSIS

Analysis is carried out as per IS 1893:2002 following parameters are considered:

1. Zone factor as zone II
2. Soil type is taken as medium soil
3. Importance Factor 1
4. Reduction factor is taken as 3
5. Damping is taken as5%

3.9 BY USING RESPONSE SPECTRUM ANALYSIS

1. Seismic Zone II
2. Soil Type II
3. Response Reduction Factor 3
4. Importance Factor I
5. Damping Ration 5%

3.10 DESIGN & MODELING

Model studied in tool and their 3-D view are show in Figure-3.1,

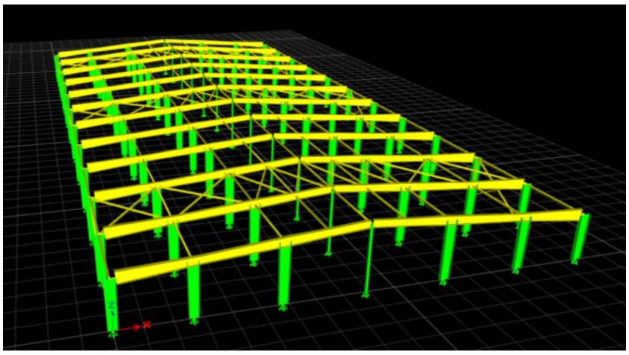

Figure-3.1: 3-D View of Model

4.0 RESULTS & DISCUSSION

4.1) MAXIMUM BASE SHEAR

Maximum base shear values for both structures are given in Table-4.1 as shown below,

Table-4.1: Maximum Base Shear

MAXIMUM BASE SHEAR (KN)			
Type of Str	Time Period (Sec)	Base Shear	Unit
LRB PEB Str	2.861	36.15	KN
FIX PEB Str	0.193	190.14	KN

Maximum base shear graphical representation for both structures are given in Figure-4.1 as shown below,

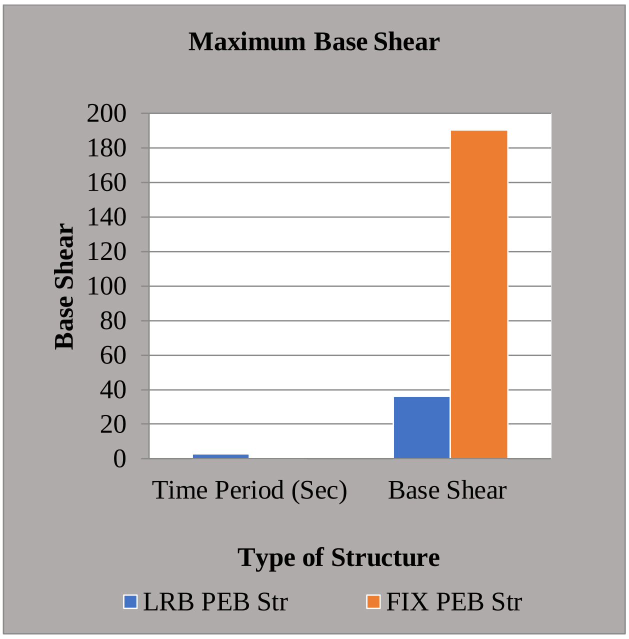

Figure-4.1: Maximum Base Shear

Compared to the results obtained (Table 4.1 and Figure 4.1) concludes that the Pre-Engineered Building with a fixed base system showed less time compared to the Pre-Engineered Building structure and the LRB system. It is noteworthy that there is an 81% reduction in the base shear structure of the PEB structure with the LRB system compared to the PEB structure with a fixed base system.

From the above comparison, it is clear that the Pre-Engineered Building with the LRB shows a very small foundation cut compared to the Pre-Engineered Building structure with a fixed foundation system. Pre-Engineered Building with LRB system compared to a Pre-Engineered Building with a fixed base system.

4.2) MAXIMUM STORY DISPLACEMENT

Maximum storey displacement values for both structures are given in Table-4.2 as shown below,

Table-4.2: Maximum Storey Displacement

MAXIMUM STOREY DISPLACEMENT (KN)			
Storey	Elevation (m)	LRB PEB Str	FIX PEB Str
Storey 2	7	29.139	1.242
Storey 1	5	29.067	0.21
Base	0	29.06	0

Maximum storey displacement graphical representation for both structures are given in Figure-4.2 as shown below,

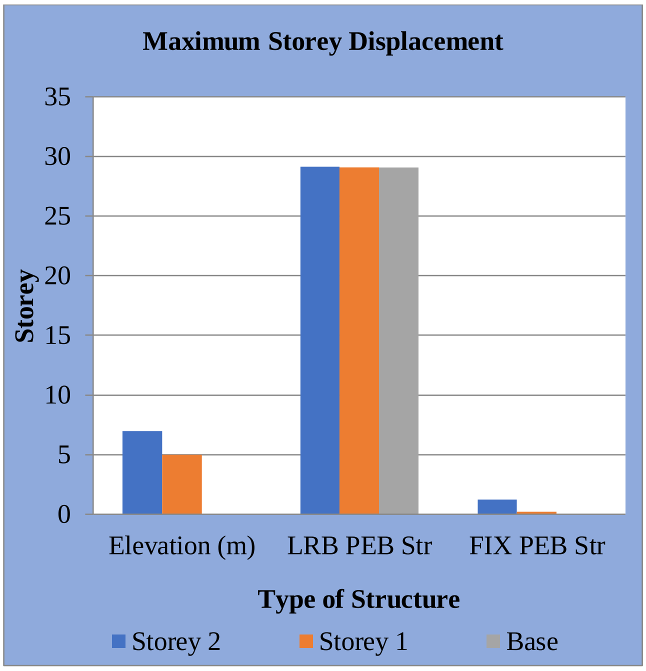

Figure-4.2: Maximum Storey Displacement

Total amount of storey displacement under the action of lateral forces. It is an important factor in response spectrum analysis where the structure is affected by seismic forces. Mainly depending on the height of the building, tall buildings are very flexible in the rear loads.

From the above comparison, it is clearly understood that the LRB base Pre-Engineered Building shows a larger evacuation area compared to the Pre-Engineered Building with a fixed base system, and it is clear that the displacement values are gradually increases at the top floor of the building. In the present study, it was noted that there was a 95.74% reduction in the relocation of the top floor of the Pre-Engineered Building with a fixed base system compared to the Pre-Engineered LRB building along Y direction.

4.3) MAXIMUM STORY DRIFT

Maximum storey drift values for both structures are mentioned in Table-4.3 as shown below,

Table-4.3: Maximum Storey Drift

MAXIMUM STOREY DRIFT			
Storey	Elevation (m)	LRB PEB Str	FIX PEB Str
Storey 2	7	0.00184	0.000177
Storey 1	5	0.0016	0.000042
Base	0	0	0

Maximum storey drift graphical representation for both structures are mentioned in Figure-4.3 as shown below,

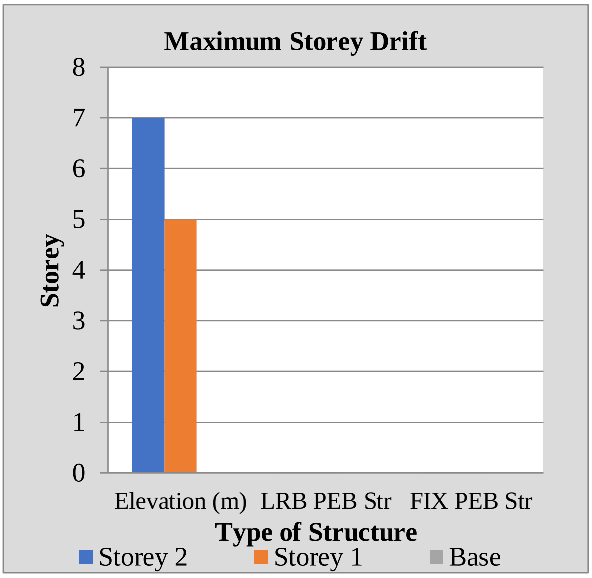

Figure-4.3: Maximum Storey Drift

Storey drift is a related shift between the floor up and / or under floor. It is also an important factor in response spectrum analysis when the structure is affected by seismic forces.

Compared to the results obtained (Table-4.3 and Figure-4.3) in Y-direction, the PEB Structure with a fixed base system showed a much lower slope compared to the PEB Structure with LRB system along Y direction.

4.4) MAXIMUM STOREY SHEAR

Obtained values of maximum storey shear for both structures are mentioned in Table-4.4 as shown below,

Table-4.4: Maximum Storey Shear

MAXIMUM STOREY SHEAR			
Storey	Elevation (m)	LRB PEB Str	FIX PEB Str
Storey 2	7	4.49	32.274
Storey 1	5	17.9143	251.0984
Base	0	0	0

Maximum storey shear graphical representation for both structures are mentioned in Figure-4.4 as shown below,

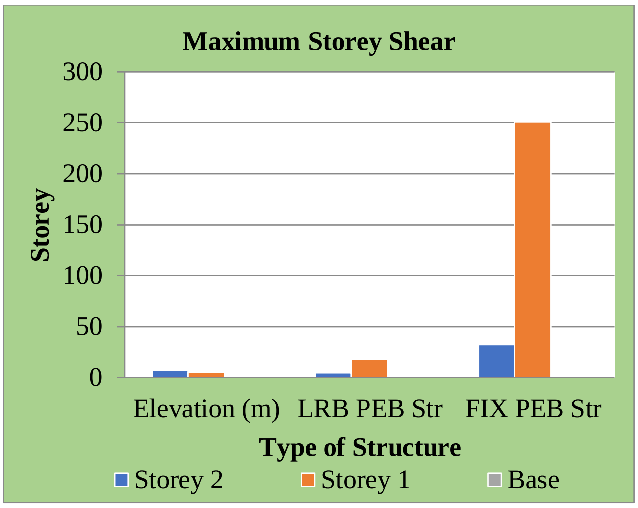

Figure-4.4: Maximum Storey Shear

Storey shear is the sum of the power of lateral design at all levels above the considered floor.

Compared to the results obtained (Table-4.4 and Figurte-4.4) due to the storey shear, the PEB Building with a fixed base system showed a higher storey shear compared to the PEB with LRB system.

From the above comparison, it is clearly understood that a Pre-Engineering Building with a fixed base system shows storey shear is higher at top level of compared to an LRB System, and it is evident that the floor prices are lower than the bottom floor. In the present study, it was noted that there was a 14 times increase in the storey shear of the Pre-Engineered Building structure with a fixed base system compared to the Pre-Engineering Building with the LRB system along Y-direction.

4.5) OVER TURNING MOMENT (KN.M)

Observated values of maximum overturning moment for both structures are noted in Table-4.5 as shown below,

Table-4.5: Over Turning Moment (KN.M)

OVER TURNING MOMENT (Kn.m)			
Storey	Elevation (m)	LRB PEB Str	FIX PEB Str
Storey 2	7	0	0
Storey 1	5	465.196	2556.1047
Base	0	552.4328	3126.81

Graphical representation of maximum overturning moment for both structures are noted in Figure-4.5 as shown below,

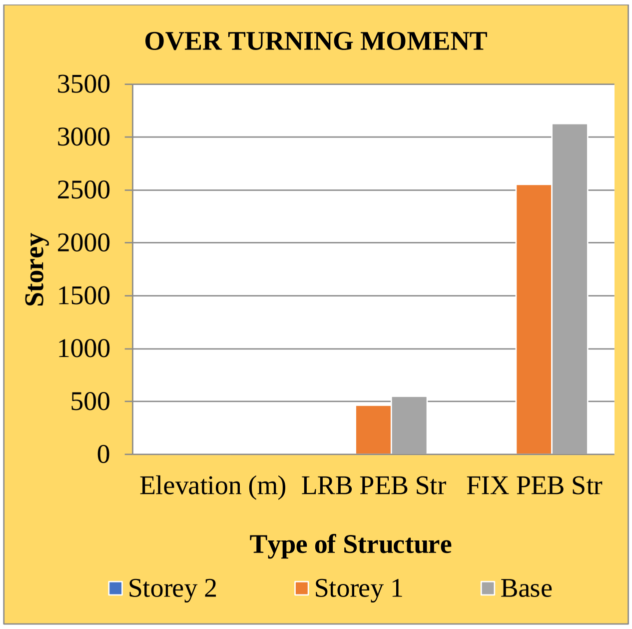

Figure-4.5: Overturning Moment (KN.M)

From Table 5 above and graph 5 respectively, it is clearly understood that a Pre-Engineered Building with a fixed base system shows a higher demolition time compared to a LRB Pre-Engineering Building.In the present study, it was noted that there was a 83% decrease in the overturning moment of the Pre-Engineering Building structure with the LRB system compared to the Pre-Engineering Building with a fixed base system along Y-direction.

Above results concluded that footing size also decreases in PEB with LRB as compared to PEB with Fixed base system.

6) STOREY STIFFNESS

Resulted values of storey stiffness for both structures are noted in Table-4.6 as shown below,

Table-4.6: Storey Stiffness

STOREY STIFFNESS (kn/m)			
Storey	Elevation (m)	LRB PEB Str	FIX PEB Str
Storey 2	7	0	0
Storey 1	5	208705.64	234089.32
Base	0	0	0

Graphical representation of storey stiffness for both structures are given in Figure-4.6 as shown below,

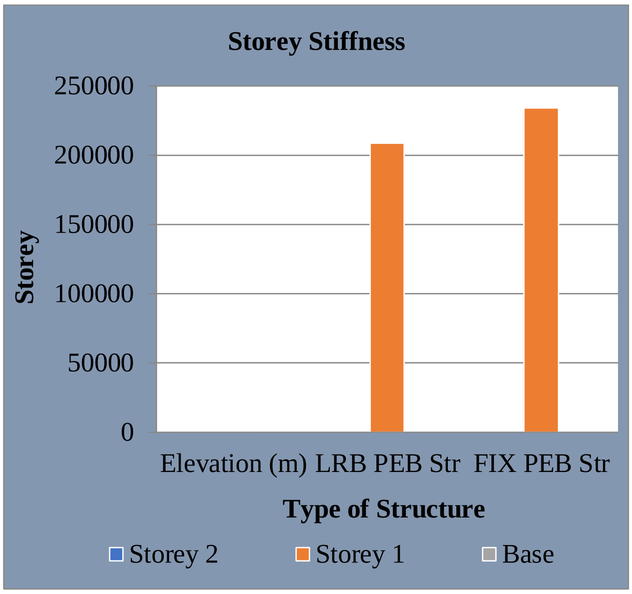

Figure-4.6: Storey Stiffness

The lateral stiffness of the floor is generally defined as the ratio of storey shear with respect to storey drift.

Compared to the results obtained (Table 6 and graph 6) due to the rigidity of the floor, the PEB Structure with a fixed base system showed higher storey stiffness compared to the PEB Structure with the LRB system near Y.

From the above comparison, it is clearly understood that a Pre-Engineering Building with a fixed base system shows a higher storey stiffness compared to a LRB System, and it is clear that the floor strength values are much higher in the 1st storey of building. In the present study, it is noted that the storey stiffness of the Pre-Engineering Building with a fixed base system is approximately 12% increases than the Pre-Engineering Building with an LRB system along Y-direction.

5.0 CONCLUSIONS

- Tapered web PEB Structure can consider for analysis.
- Non-linear time history analysis can be performed.
- Different types of base isolation system can be compared.
- Compared to the graph, the graph model based on fix & LRB Base shows that the base shear has been expanded to the PEB fixed structure. It is noteworthy that there is an 81% reduction in the base shear structure of the PEB structure with the LRB system compared to the PEB structure with a fixed base system.
- It shows that the fundamental time period of PEB model with LRB system is gradually increases.
- We observed that the Base isolated (LRB) PEB str. has more displacement than a fixed base PEB structure. In the present

study, it is noticed that there is a reduction of 95.74% the top storey displacement of Pre-Engineered Building structure with fixed base system compare to Pre-Engineered Building structure with LRB system along Y direction.

- Pre-Engineered Building structure with fixed base system exhibited least storey drift compared to Pre-Engineered Building structure with LRB system along the Y direction.
- From the above comparison, it is clearly understood that Pre-Engineered Building structure with fixed base system exhibit higher storey shear compared to Pre-Engineered Building structure with LRB system. This study concluded that there is an increase of 14 times in the base storey shear of Pre-Engineered Building structure with fixed base system compare to Pre-Engineered Building structure with LRB system along Y direction.
- Observed that the Base isolated (LRB) PEB str. has gradually decrease in overturning moment than a fixed base PEB structure. It is noticed that there is an decrease of 83% in the base overturning moment of Pre-Engineered Building structure with LRB system compare to Pre-Engineered Building structure with fixed base system at base along Y direction.
- It is noticed that the base storey stiffness of Pre-Engineered Building structure with fixed base system is nearly 12% more than Pre-Engineered Building structure with LRB system along Y direction.

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