International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 8, pp: 670-677 www.ijaem.net ISSN: 2395-5252

# A Review on Comparative Study of Pre Engineered Building, Conventional Steel Structure and Rc Structures

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Date of Submission: 01-11-2020 Date of Acceptance: 15-11-2020

**ABSTRACT:** The Pre-Engineered Building construction methodology has rapidly transformed to meet the concept of modern building which requires aesthetic look, cost effective, fast construction, innovative and high strength. Long Span, Column free structures are the most essential in any type of industrial structures, and Pre-Engineered Buildings (PEB) fulfills this requirement along with reduced time and cost as compared to conventional structures and conventional steel structure. One such revolution is PEB. This methodology is versatile not only due to its quality pre-designing and prefabrication, but also due to its light weight and economical construction. The concept includes the technique of providing the best possible section according to the optimum requirement. This review from the past experiences presents the results of experimental and analytical studies done on PEB, CSB and RC Structure. Results show that PEB reduces Time of construction and cost.

**KEYWORDS** : Pre-Engineered Building, Conventional Steel Structure, RC Structure

## I. INTRODUCTION

In recent years, The Pre Engineered Building (PEB) has helped in optimized cost,time and design. The construction of PEB in the place of Conventional Steel structure and Reinforced concrete structure where design concept resulted in many advantages as the members are designed as per bending moment diagram and thus reducing the material requirement .Though its origin can be traced back to the 1960's its potential has been felt only during the recent years. Until 1990, the use of pre engineered buildings was confined mostly to north america and the middle east. Since then the use of PEB has been spread throughout Asia and Africa where this PEB concept is accepted and used.The first rigid-frame buildings introduced in the late 1940s could span only 40 ft. In a few years, 50-, 60-, and 70-ft buildings became possible. By the late 1950s, rigid frames with 100-ft spans were made successful.The first rigid-frame buildings introduced in the late 1940s could span only 40 ft. In a few years, 50-, 60-, and 70-ft buildings became possible. By the late 1950s, rigid frames with 100-ft spans were made, ribbed metal panels became available, allowing the buildings to look different from the old tired corrugated appearance.

PEB are nothing but steel buildings in which excess steel is avoided by tapering the sections according the bending moment.In PEB concept configurations are more simple and we can save a much amount of steel whereas conventional steel buildings(CSB) includes truss works that require a large amount of steel and RC structure includes large quantity of concrete where its expensive. But, PEB makes the structure so flexible and less in weight.The use of steel structures is not only economical but also eco-friendly at the time when there is a threat of global warming. Here, "economical" word is stated considering time and cost. Thus PEB the total design is done in the factory as per structural design,members are pre fabricated and then transported to site where they are erected in a time span of 6-8 weeks.Steel structure also have much better strength to weight ratio than RCC and they can easily be dismantled.hence after dismantle steel can be reused

## II. CATEGORIES OF BUILDING

### 1.RC STRUCTURE

RCC buildings are the most widely used methodology of construction around the globe. RCC those which are made up of cement concrete reinforced with steel bars. Steel bars are used to increase the tension capacity of the structure.steel is good in tension but weak in compression whereas Cement concrete can take compression but weak in tension.The buildings are planned as a combination of columns and beam, slab system. All the sections are reinforced with steel and concrete.

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## 2.CONVENTIONAL STEEL STRUCTURE

In the past, for the design building, the choice was normally between a concrete structure and a masonry structure. But now-a-days steel composite buildings are built across rapidly for commercial and industrial purposes. Steel offers speedy construction right from the start. Due to its important characteristics like ductility, flexibility etc, steel has been widely used in the construction industry.CSB are low rise steel structures with roofing systems of truss with roof coverings. They are constructed with the traditional method. Conventional steel buildings use rolled sections and due to that the weight of the structure increases.Here the members are fabricated in factories and then transported to the site. The changes can be made during the erection by welding and cutting process. Normally trusses are used in this system.Industrial building is generally classified as braced and unbraced framed structures. In braced buildings, the trusses rest on columns with hinges and stability is provided by bracings in three mutually perpendicular planes.

## 3.PRE ENGINEERED BUILDING

Large span, column free are the most essential in any type of industrial structures and Pre Engineered Buildings (PEB) fulfill this requirement along with reduced time and cost as compared CSB and RCC.PEB the large amount of steel is saved according to bending moment diagram whereas section is tapered. The pre -engineered buildings usually I shaped members are used and they are called as I beams(primary members). These beams are usually formed by welding together steel plates in the factory. manufacturers taper the sections mean decreasing the size of the web at the bottom as per design so that weight is reduced and steel is saved. Lightweight cold formed "Z" or "C" shaped sections are provided in secondary elements to fasten and support external cladding. Possibly no further changes can be made at the site at the time of erection such as welding and cutting.bolts and welding is done for connecting the members.

## III. PEB ADVANTAGE

**3.1 Low initial cost**:- The primary members (column and rafter) usually results upto 40% of weight less for rigid frames as compared to CSB rigid frames.The use of cold formed "Z" or "C" shaped as secondary members in PEB whereas in CSB hot rolled channels is for purlins and girts results varies about 30%less in PEB.The foundation requirements of PEB are fewer and lighter.The cost of initial engineering of the structure,as well as later design revisions, is substantially reduced due to the inclusion of the engineering costs within the supply price of the PEB.

**3.2 Large Clear Spans**:- Buildings can be supplied to around 90m clear spans. This is one of the most important advantages of PEB giving column free space.

**3.3 Fast project construction**:- standard building delivery is only 8 weeks (including engineering time) and may be reduced to as 6 weeks for special "fast project.All members bolted according to the drawing in the site

**3.4 Low Maintenance**:- roof panels require only periodic cleaning whereas no maintenance required for wall panels.Buildings are supplied with high quality paint systems for cladding and steel to suit ambient conditions at the site, which results in long durability and low maintenance coats.

**3.5 Erection**:- since the connection of components is standard erection is faster.erection is done by the manufacturer itself.erection is done faster and less number of equipment are required for erection.

**3.6 Aesthetic**:- outstanding architectural results can be achieved at low cost using standard architectural drawing.Building can be supplied with various types of fascias, canopies, and curved eaves and are designed to receive pre cast concrete wall panels, curtain walls, block walls and other wall systems.

**3.7 Less manpower**:- most of the work in PEB is done in the manufacturing units thus the requirement of manpower is very less compared to other buildings.

**3.8 Functional Versatility:-**Both the length and width can be expanded for future scopes.building design can incorporate additional standard structural subsystems such as mezzanines, cranes ,roof platforms.

**3.9 Seismic resistance:-**The super structure made of steel is light in weight and flexible enough to offer greater seismic waves when compared to CSB.

**3.10 Large clear spans:-** Buildings can be supplied to around 90m clear spans. This is one of the most important advantages of PEB giving column free space..

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**3.11 Sustainability:-**Steel is 100% recyclable and is the most recycled material in the world. Thus, each ton of recycled steel saves 2,500 pounds of iron ore and approximately 1,000 pounds of coal.

## IV. APPLICATIONS OF PEB

**4.1 Institutional :-** Schools, Exhibition halls, Hospitals, Theatres**.**

**4.2 Commercial :-** Showrooms, Distribution centers, Supermarkets, Fast food restaurants, Offices, Labor camps, Service stations, Shopping centers.

**4.3 Industrial :-** Factories, Workshops, Warehouses, Cold stores, Car parking sheds, Slaughter houses, Bulk product storage.

**4.4 Military :-** Aircraft hangars, Administration buildings, Residential barracks.

**4.5 Sports :-** Indoor stadium, outdoor stadium, swimming pool enclosure.

**4.6 Agricultural :-** Poultry buildings, Dairy farms, Grain storage, Animal confinement.

## V. COMPONENTS OF PEB

**5.1 MainFrames :-** The main frames (Primary Members) are the main support members and carry the main load of the Pre-Engineered Building . Main frames include steel rigid frames of the building. The PEB steel rigid frames include tapered columns and tapered rafters. These tapered sections are fabricated using the state of art technology while the flanges are welded. The frame is then erected by bolting the splice plate of the connecting section together.

**5.2 Secondary structural frames :-** Secondary framing runs in between primary framing elements , creating a structure within a structure. The purpose of the secondary frames is to distribute loads from the building's surface to the main framing and the foundation.secondary framing can add longitudinal support that helps resist wind and earthquakes and it can provide lateral bracing for compression flanges that are part of the primary framing framing increasing overall frame capacity. Secondary structural framing consists of purlins, girts, eave struts, wind bracing, flange bracing, base angles, clips and other miscellaneous structural parts. Secondary framing is mainly purlin and girt of Z or C shapes of various sizes. In Pre-engineered buildings normally cold form Z sections are used

**5.3 Roof and Wall panels :-** Panels used for sheeting purpose are generally of ribbed steel sheets used as roof and wall sheeting, roof and wall liners, partition and soft sheeting .The steel sheets are hot dipped and galvanized with zinc or zinc-aluminum .profile sheets permanently colour coated, plain or sheets can be coated with special paints for better anti-corrosion properties.

**5.4 Mezzanine system :-** Mezzanine system is used in steel buildings for additional floors or space for various purposes.Mezzanine floors are very quick to construct and cost effective ways to create new space without the expense and inconvenience of relocation**.** Standard mezzanine system consists of a profiled steel deck, mezzanine joists, built-up beams span in lateral directions and mezzanine joists in longitudinal directions bolted to the top flange of beams. A light reinforcement over decking and light concrete is used to make a permanent floo**r.** Concrete is poured over GI decking of profiled metal sheets.

**5.5 Crane system :-** All Pre-engineered steel buildings can be designed for crane operation needs. There are various types of crane being used in industry for various purposes- EOT overhead crane with pendant or cabin operated, overhung/under -slung crane system, Monorail crane or hoist system, Wall mounted crane and Jib crane.

**5.6 Insulation :-** These buildings are properly insulated through insulation slab/rolls and then the roofing steel sheet is fixed over it. The main purpose of insulating a building is to reduce the heat transfer coming through the ceilings and openings.

**5.7 Paints and finishes :-** Pre-painted steel is produced on modern, high speed coil painting lines where surface preparation prior to painting, paint application and paint curing is done on a highly automated line under optimum condition.

## VI. LITERATURE REVIEW

**Neha R.Kolate, Shipa Kewate et. al,(2015)**observes that comparative study between pre-engineered building and conventional steel building.have studied the importance of having long span and structures having column free area in industrial structures and pre-engineered-building are the ones which can fulfill such requirement. PEB has many advantages over CSB such as zero maintenance and superior strength, it is corrosion resistant and features an attractive appearance and it is high level technology innovation and better product over conventional material. The PEB system has protection against non-uniform weathering. In this paper comparison of PEB and

CSB for a 60m length and 30m width varying bay spacing 4m, 5m and 6m respectively its analyzed and designed for wind zones (wind zone 2, wind zone 3, wind zone 4 and wind zone 5) by using STAAD Pro V8i.considering cases of wind zones from their research they found that conventional steel-building is 23% heavier than pre-engineered-building and also the steel wastage of pre-engineered-building is less, thereby reducing the cost of construction. They also concluded that conventional steel-building is used for clear spans up to 90m but pre-engineered-building is used for greater than 90m.

**Sudhir Singh Bhadoria , Yash Pathak et. al,(2017)** Observes that comparative study of pre-engineered building and conventional steel building where in case of PEB its custom designed to meet client's requirements and in Conventional steel structure, there has always been an issue of huge steel consumption and higher cost of the structure.this study deals to resolve such issues by replacing conventional steel structure with PEBs. The concept and attracting features of PEB such as members are designed as per the bending moment diagram of the steel frame, in order to make the structure economical in terms of steel consumption and cost. where, various models of PEB span ranging from 10m to 50m i.e. 10m,20m, 30m,40m,50m are compared with another five models of conventional steel structure of span same as that of PEB. Models of both the systems are designed using Staad Pro Software and analyzed under Dead , live, wind and Seismic load .Comparative study made on various models of Pre-Engineered building and Conventional steel structure shows that PEB is an economical option and its concluded that up to a certain value of clear span Pre-engineered building are most economical option and after a specific span steel quantity in PEB is almost same as that of conventional steel structure. Provision of tapered section in PEB makes it economical and tapering of section is done as per the bending moment diagram. From all the analysis of models that steel consumption in PEB is on an average 30% lesser than conventional steel structure. PEB frames are light and more flexible than conventional steel frames and provide higher resistance to seismic forces.

**Shalu Assis et. al,(2019)** studied comparison of steel weight for pre-engineered building and conventional steel building. Pre-Engineered buildings are designed according to the bending moment diagram of elements so that the sections are tailored according to the bending moment. This makes the structure more simple and light weight. In this paper comparative study of PEB structures and CSB structures are designed for 60m length, 20m width &6m height each bay is spaced at 4m span.Is analysed under dead,live,wind and seismic load.They concluded that conventional steel buildings is 50% heavier than pre-engineered buildings in terms of weight.so steel consumption is very less in PEB while comparing CSB.PEB construction is 30 to 40% faster than conventional steel structures Provide good insulation effect and would highly suitable for a tropical country like India PEB is ideal for construction in remote and hilly areas.

**Swati Wakchaure and N.C.Dubey et. al,(2016)** have shown by using pre-engineered buildings in construction, there are various advantages because according to the bending moment diagram, the designing of members is done. As a result, the steel is reduced. In this study, an industrial structure PEB Frame & CSB Frame is analyzed and designed according to the Indian standards, IS 800-1984, IS 800-2007 where, a structure with length 80m, width 60m,with clear height 11.4m and having R-Slope 5.71 Degree for PEB & 18 Degree for CSB is considered to carry out analysis & design for 2D frames . The economy of the structure is discussed in terms of its weight comparison, between Indian codes (IS800-1984, IS800-2007) & in between PEB & CSB building structure. From their study they concluded that conventional steel buildings are 30% heavier than pre-engineered buildings and as a result the size of foundation is reduced in PEB.

**Quazi Syed Shujat, Ravindra Desai et. al,(2019)** observes the utilization ratio and weight in a comparative study of Conventional steel building (CSB), Pre Engineered Building(PEB) and Tubular Structure. The design is made as per IS 800-2007. Dead load, Live load and wind load calculation is made IS 875 part I, II and III respectively. The concept includes the technique of providing the best possible section according to the optimum requirement. This concept has many advantages over the Conventional Steel Building (CSB) concept of buildings with roof truss. Design and analysis is done for a length 50m, width 20m, height 8m and with an 5m bay spacing.This study shows that 17.3% PEB is economical than CSB and avg utilization ratio for CSB is 0.45 and PEB 0.52.

**Md Shahid Wasim Chaudhary, Vishwajeet Kadlag, Nagesh Shelke et. al, (2019)** observes the Comparison of Conventional steel buildings and Pre Engineered Buildings can be used extensively for the construction of Industrial , Commercial and Residential Buildings .These buildings can be multistoried (4-6 floors).The adoptability of PEB in the place of CSB design

concept resulted in many advantages, including economy and easier fabrication. Construction of CSB incorporates the use of hot rolled sections, which have uniform cross-section throughout the length. However, PEB utilizes steel sections, which are tailored and profiled based on the required loading effects. Due to lack of awareness and confidence in design and execution of PEB buildings, still it is not the first choice of owner and designer in India. The study involves PEB and CSB for multi-storey building by analyzing and designing G+4 commercial buildings with length 140m ,width 40m,eave height 18m, R slope 1/10 using STAAD PRO and IS 800-2007. The study observed that the weight of the PEB model is lesser than that of the CSB model of the same length, width and height. Reduction in weight directly deals with the quantity of steel required, here in this study of G+4 commercial PEB structure reduces the quantity of steel by about 39% than that required by the G+4 commercial CSB structure.

**Milind BhojkarP P,MilindDaradeP et. al,(2014)** this study, the Cost and time effective is compared for pre-engineered building and conventional steel structure various tools which helps to utilize the optimum cross-sections of steel. In this study the various concepts regarding the pre engineering building and its various applications. There are various types of pre-engineered building components that are explained; Primary components consist of column and rafter, Secondary components consist of eave strut,purlins,girts and bracing and then Sheeting is explained. In this study we find out that Pre engineering building is more economical than conventional steel building over the years. PEB roof structure is almost 26% lighter than Conventional Steel Building. PEB building cost is 30% lesser than the cost of CSB structure.Various aspects related to design and modeling of PEB structure.

**Jhothi D N et. al,(2018)** observes comparative analysis of RCC and steel structure where in high rise buildings steel is generally used rather than RCC. Steel members have the advantages of high tensile strength and ductility while concrete members have the advantages of high compressive strength and stiffness. This paper deals with the comparison between the RCC and steel structures in accordance with their structural behaviour, Cost and other factors which help in deciding the best suitable materials for construction. This study consists of G+2 building and analysis. These models are analysed for shear forces and bending moments using staad Pro software. A building constructed using steel has less dead load on it, even the bending moment and shear forces acting are determined less . It has high strength per unit mass. Hence even for large structures, the size of steel structures elements is small, saving space in construction and improving aesthetic view. Speed of construction is another important advantage of steel structure. Since Standard sections of steel are available which can be prefabricated in the workshop, they may be kept ready by the time the site is ready and the structure erected as soon as the site is ready. Hence there is a lot of saving in construction time.

**Parag P. Limbare, P.O Dode et. al,(2018)** In the study RCC structure with steel concrete composite are considered for comparative study of G+20 multistory building which is situated in earthquake zone-II and for earthquake loading, the provisions of IS: 1893 (Part1)-2002 is considered. This study word 'composite' in composite material signifies that two or more materials are combined on a macroscopic scale to form a useful material and the individual materials are easily distinguishable. The design and analysis of the structure are carried out with the help of STAAD-PRO software. The results are compared and found that composite structure is more economical. it is clear that the weight of Composite structure is reduced by 23.52% as compared with RCC structure. The story displacement of Composite structure is 20.93% more as compared with RCC. The base shear of Composite structure is reduced by 24.8% as compared with RCC structure. The axial force in Composite structure is less as compared with RCC by 20.48% . The time period of Composite is more as compared to RCC by 18.97% and Time required for construction of composite structure is less as compared with RCC structure because no form work is required.

**Renavikar Aniket V , Suryawanshi Yogesh et. al,(2015)** This study involves analysis and cost comparison of RC Structure and steel composite structure. A residential structure of four multistoried buildings of G+9, G+12, G+15, G+18, with 3.0m as the height of each floor. The overall dimension of the building is 15m x 9m. The analysis involves the load calculation, analyzing it by 2D modeling using software STAAD-Pro 2007. Analysis has been done for various load combinations as per the Indian Standard Code of Practice.The study has various types of shear connectors explained. There is the reduction in cost of steel structure as compared to R.C.C. structure due to reduction in dimensions of elements. The steel composite option is better than R.C cost comparison for multistoried buildings is 43.1% for G+9, 47.3% for G+12, 48.8% for G+15 and 57.7%

for G+18. where the composite option for high rise buildings is best suited. Weight of the composite structure is low as compared to R.C.C. structure which helps in reducing the foundation cost. Composite structure is more economical than that of R.C structure. Composite structures are the best solution for high rise structure as compared to R.C structure.

**Sangita C. Dike, Sandip.A.Karale et. al,(2018)**This study shows PEB constructions are nowadays popular owing to their advantages over RC structure. Concrete structures are bulky and impart more seismic weight and less deflection whereas Steel structures instruct more deflections and ductility to the structure, which is beneficial in resisting earthquake forces. PEB Construction combines the better properties of both steel and concrete along with lesser cost, speedy construction, better quality control, sustainability etc. Hence the comparison performance of a G+2 story RCC and PEB frame. Both frames are designed for same loading combinations. Beam and column sections are made of either RCC, Steel sections. STAAD PRO software is used for analysis and design and analysis results are compared.PEB is Cost effectiveness based on material cost while comparing both buildings . Base Shear is 50% more in case of RCC frame compared to PEB frame.As the base shear increases the forces in member will increase which leads to increase in the sizes of the structural members and increase in the weight of the building. Moment in Column along X direction and Y direction of PEB frame is observed 80% more as compared to RCC frame. Moment in Column along Z direction of RCC frame is observed 17% more as compared to PEB frame. Moment in beam along X direction and Z direction of RCC Frame is observed 76% more as compared to PEB frame. From the study cost analysis, it has been observed that there is reduction in material cost of PEB frame as compared with cost of RCC frame.

**Monika Nakum, Jigar Zala, Darshan Shah et. al,(2018)** observes the cost effectiveness of multi storey building of CSB and PEB .The concept includes the technique of providing the best possible section according to the optimum requirement & cost effectiveness. In this paper, CSB & PEB are analysed & designed using IS: 800:2007 Here, we have taken 5 different plan areas & different material specifications for that plan for study of cost effectiveness. This study of PEB & CSB Structure observed that the high material strength reduces the cost of building. Considering the same material specification (Fy = 250 MPa) in CSB 250 & PEB 250, we found that PEB 250 plan 5 (having area of 9720 m2 ) is 17.5% less than CSB 250. Changing Fy from 250 to 345 MPa yield strength, in CSB 250 & PEB 345 models we achieved for plan 5 (having area of 9720 m 2 ) is 26.3% less in PEB 345. So, from the study, high material strength reduces the cost of building. Comparison of PEB 250 & PEB 345 models we found that PEB 345 plan 5 (having area of 9720 m2 ) is 8% less than PEB 250. We observed that as the area increasing of the building leads to the cost effectiveness in pre engineered building. Going through the overall study and results leads to the use of Fy = 345 MPa material to achieve best cost effectiveness.

**Syed Firoz , Sarath Chandra Kumar B , S.Kanakambara Rao et. al,(2012)** The study of pre-engineered building systems which has numerous advantages over other types of buildings. A practical and efficient alternative to conventional buildings, the System representing one central model within multiple disciplines. Pre engineered building creates and maintains in real time multidimensional, data rich views through a project support is currently being implemented by Staad pro software for design and engineering Choosing steel to design a Pre-engineered steel structures building is to choose a material which offers low cost, strength, durability, design flexibility, adaptability and recyclability. Steel is the basic material that is used in the Materials that are used for Pre engineered steel building. It negates from regional sources. It also means choosing reliable industrial products which come in a huge range of shapes and colours; it means rapid site installation and less energy consumption. It means choosing to commit to the principles of sustainability. Infinitely recyclable, steel is the material that reflects the imperatives of sustainable development.

**Santosh S. Patil, Sujay Deshpande et. al,(2018)** observes the design and analysis of pre engineered building (PEB) with different geometries where it helps to optimize the design. The construction of PEB in the place of Conventional Steel Building design concept resulted in many advantages as the members are designed as per bending moment diagram and thus reducing the material requirement. This methodology is versatile not only due to its quality pre-designing and prefabrication, but also due to its lightweight and economical construction. In this study, three models of industrial structures of PEBs are analyzed and designed according to the Indian standards. The models are considered having different geometries and a parametric study is carried out to assess the performance of the models in terms of self-weight, cost of construction and

time of construction. The study of Self-Weight of the models showed that the Self-Weight for PEB structures is relatively lesser than conventional steel structures, for the same geometry. PEB structures are preferable for bigger sized structures up to a certain optimum span. For smaller sized structures, the use of PEB technology won't affect the overall performance and cost. So, conventional steel building technology can be adopted for smaller sized structures whereas PEB technology can be adopted for bigger sized structures up to a certain optimum span. The study, Time of Construction of the models shows that PEB structures can be constructed in a relatively lesser time compared to the conventional steel structures, for the same geometry. On an average, the PEB structures can be constructed in about 30% less time than conventional steel structures.

**D Rakesh et. al,(2016)** observes comparative study of pre-engineered building and RC building where displacement and steel quantity is compared. In this study pre engineered structure shows less displacement in column and less consumption of steel. Pre-engineered steel structure building offers low cost, strength, durability, design flexibility. Based on the analytical design results theorem of conventional and pre engineered steel building. The total steel take-off for PEB with primary frame spacing of 5m is 60% of the conventional steel building. It is also seen that the weight of PEB depends on the Bay spacing, with the increased bay spacing up to certain spacing the weight reduces and further increase makes the weight heavier. Pre Engineered Building Construction gives the end users a much more economical and better solution for long span structures where large column free areas are needed. Hence authors propose Pre-Engineered Building Construction is more cost effective and economical when compared to conventional steel building and construction time and cost also reduces.

**Neeraja Gaidhani , M Helen Santhi et. al,(2018)** observes special steel connections on PEB which helps steel industry grow rapidly in almost all the parts of the world. The use of steel structures is not only economical but also eco friendly at the time when there is a threat of global warming. Long Span, Column free structures are the most essential in any type of industrial structures, and Pre-Engineered Buildings (PEB) fulfills this requirement along with reduced time and cost as compared to conventional structures. This study involves the detailed design and Analysis of connections in Pre-Engineered Buildings (PEB). Comparison between connections of PEB and Conventional Steel Buildings are done. Steel is the basic material that is used in the materials that are used for Pre-engineered steel building. For longer span structures, Conventional buildings are not suitable with clear spans. Pre-engineered buildings are the best solution for longer span structures without any interior column in between as seen in this present work. With the advent of computerization, the design possibilities became almost limitless. especially for low rise buildings spanning up to 90.0 meters with eave heights up to 30.0 meters. PEB structures are found to be costly as compared to Conventional structures in case of smaller span structures. They showed that the PEB sections are lesser in size, the required number of bolts is also very less as compared to CSB , connection plates used for welding are smaller in size as compared to connection of CSB due to less self weight of PEB thus helps in optimizing the size of connection plates.

**Hemant Sharma et. al,(2017)** observes that comparison between pre-engineered building with conventional steel building where the bending moments occurs at different sections. Also considered different components of the pre-engineered building used at the site. To design and analyze the PEB and CSB they have taken length of 20m,18m width,8m height at a bay spacing of 4m using Staad pro as well as Indian standard codes and finally compared the two structures in terms of Economy and Time saving of construction.They tried truss systems for cladding and roofing system purposes. In the analysis they have analyzed and designed the Purlins, Girts, Eave Struts and Bracings.Where in terms of weight of steel section CSB is 40% heavier than PEB as comparison shows.

## VII. CONCLUSION

From past studies the PEB are proven to be more economical and result in material saving than conventional steel structure and RC structure. It is reviewed that PEB structures can be easily designed by simple design procedures in accordance with country standards, it is energy efficient, speedy in construction, saves cost, sustainable and most importantly its reliability as compared to conventional steel structure and RC Structure. For longer span structures, Conventional buildings are not suitable with clear spans. Pre-engineered buildings are the best solution for longer span structures without any interior column in between as seen in this present work. Infinitely recyclable, steel is the material that reflects the imperatives of sustainable development. PEB can better meet the requirements of flexible separation

between large openings in buildings than the traditional buildings and can improve the area utilization rate by reducing the cross-sectional area of the columns and using lightweight wall panels. Since Standard sections of steel are available which can be prefabricated in the workshop, they may be kept ready by the time the site is ready and the sections are erected to site when it is ready for construction. PEB frames are light and more flexible than conventional steel frames and provide higher resistance to seismic forces.

Thus PEB methodology must be implemented and researched for more outputs.

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