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A Review Study on uses of steel in construction

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Abstract - *This paper reviews the uses of steel in Civil Engineering field. It comprises the important findings from the experimental works of many researchers. Due to over dependence on concrete is becoming an imminence and therefore it is necessary to look for the possibility of steel structure. Peoples in country like India it has been a mindset that only R.C.C building is long life, durable and withstand any forces. Steel structure is used on large area in industries but today there is a need to make it possible in residential also. Use of concrete on large scale result in destruction of natural resources on large level by mining, blasting, crushing. Steel structure provides a better replacement. It construction is light in weight and rapid. Steel is totally biodegradable and recyclable product.*

Key Words: Steel structure, Concrete, Temperature resistant, Construction,

1. INTRODUCTION

Steel is an alloy of Iron and Carbon. Off all the structural building material in use today steel is the most universally useful and versatile material for engineering construction. Steel is known to have given a structure that no other can when it comes to construction. The durability and potency that steel provides is not matched by wood or concrete. Steel structure is an assemblage of a group members expected to sustain. Steel is highly elastic, ductile, malleable and weld able. Steel has high tensile and compressive strength and also stands wear and tear much better. The most important feature of steel used in construction in large scale is its flexibility that it can bend without cracking. Steel structure are particularly good at providing an energy dissipation capability. Steel is a material which has high strength per unit mass. Function of all the structure is that it with stand stressed due to load that is wind, earthquake, without failure or undue distress such as excessive deflection.

Understanding of seismicity and Seismotectonics of areas is essential. Steel is one of the most widely used material for building construction in the world .The inherent strength, toughness and high ductility of steel are characteristics that are ideal for seismic design. To utilize these advantages for seismic applications, the design engineer has to be familiar with the relevant steel design provisions and their intent given in codes.

As we all know now days the construction sector is exploring rapidly on a large scale and also involves new techniques for rapid and comfort works on the field. Concrete which is the main building material plays an important role in this sector. Natural resources are main ingredient of concrete which are expensive as well as on the verge of extent. So it is very important to find an alternative option. Steel can be use as an alternative by replacing concrete. Quarrying of aggregates leads to disturbed surface area decrease in water level, wastage of water also. Most common types of steel used in construction are, Plain Carbon Steel or Mild Steel, Rebar Steel, Structural Steel.

Structural steel shapes are made out of this kind of steel, which is formed out of a precise cross section, at the same time it follows definite standards for mechanical properties and chemical composition. Structural steel comes in various shapes like I-Beam, Z shape, HSS shape, L shape (angle), structural channel (C-beam, cross section), T shaped, Rail profile, bar, rod, plate, open joist of web steel etc.

Standard structural steel varies in different countries with different specifications. Structural steel is fire resistant in itself but fire protection should be provided in case there is a possibility of it getting heated up to a point where it starts to lose its strength. Corrosion must be prevented when it comes to structural steel, but tall buildings are known to have withstood various kinds of calamities when built using structural steel.

3. LITERATURE REVIEW

Many authors have reported the use of steel in various civil engineering applications.

***Christopoulus* et al. (2008)** An advanced cross bracing system has been used in University of Toronto called (SCEDs) Self centering energy dissipating frames. Alike, Special moment resisting frames and Buckling reinforced braced frames, they also dissipate energy, but they have selfcentering capabilities which reduce residual building deformation after major seismic events.

***C.Y. Ho and G.G. Schierele* (1990)** Published a journal paper Effect of configuration and lateral drift on High-rise space frames. Excessive lateral drift in high-rise frames can damage secondary systems, such as partitions walls; generate secondary column stress due to P-δ moments; and cause discomfort to building occupants under prolonged cyclical drift. Damage to secondary system can be controlled by reducing drift. The P-δ effect is most severe in moment resisting frames;

the Uniform Building Code allows smaller seismic drift for moment resisting frames (0.3% story drift vs. 0.5 % for other systems). Design for wind or seismic forces are usually based on objectives to minimize lateral drift. To reduce lateral drift of high-rise buildings is an important design consideration in areas of high wind and/or seismic activity.

E.M. Hines and C.C. Jacob **et.al (2009)** The seismic performance of low-ductility steel systems designed for moderate seismic regions have generated new interest in the cost-effective design of ductile systems for such regions. Although eccentrically braced frames (EBFs) have a well-established reputation as high-ductility systems and have the potential to offer cost-effective solutions in moderate seismic regions, their system performance has not been widely discussed. Eccentrically Braced Frames (EBFs) are known for their attractive combination of high elastic stiffness and superior inelastic performance characteristics (AISC 2005).

Ghobarah A. et al., (1997) The study shows that the inter story drift can also be considered as a means to provide uniform ductility over the stories of the building. A story drift may result in the occurrence of a weak story that may cause catastrophic building collapse in a seismic event. Uniform story ductility over all stories for a building is usually desired in seismic design.

Hanson and Martin (1987); Kelly et al. (***2000)*** The typical failure mode experienced by special moment resisting frames with bracing that. Damage to braces, brace to frame connections, columns and with base plates were studied.

K.G.Vishwanath**(2010)** Presented on "Seismic response of Steel braced reinforced concrete frames" in International journal of civil and structural engineering 2010 .A four storey building was taken in seismic zone 4 according to IS 1893:2002 . The performance of the building is evaluated according to story drift. Then the study is extended to eight story and twelve story. X type of steel bracing is found out to be most efficient.

K.K.Sangle,K.M.Bajori,V.Mhalungkar **(2012)** Has done research work on "Seismic Analysis Of High Rise Steel Frame Building With And With Out Bracing" The Aim of study was to compare the results of seismic analysis of high rise steel building with different pattern of bracing system and without bracing system. By using time history analysis the result of the study shows that bracing element will have very important effect on structural behavior under earthquake effect.

S.H. Chao and M.R. Bayat **et.al (2008)** Studied on performance based plastic design of steel concentric braced frames for enhanced confidence level in China. Concentrically braced frames (CBFs) are generally considered less ductile seismic resistant structures than other systems due to the brace buckling or fracture when subjected to large cyclic displacements. This is attributed to simpler design and high efficiency of CBFs compared to other systems such as moment frames, especially after the 1994 Northridge Earthquake.

S. Krishan., **et.al (2008)** Modelling steel moment frame and braced frame buildings in three dimensions using FRAME3D, he work to development of steel frame building.

Sudhir K. Jain**(2003)** Reviewed the new code OF IS 1893 (part-1):2002 contains a discussion on clauses that are confusing and need classifications. The topographical and editorial errors are pointed out. Suggestions are also included for next revision of the code.

Tremblay et al. (2008) An extensive analytical study is performed to compare the Buckling restrained braced frames with self-centering energy dissipating frames. According to the results, the residual deformation of SCED brace frame systems is negligible under low and moderate hazard levels and is reduced significantly under MCE or maximum considered earthquake level.

3. CONCLUSION

This investigation results the following conclusion.

1. Steel provide light weight structure in comparison to concrete.
2. Steel structure easily allow alteration and expansion if needed.
3. Steel provide rapid construction in comparison to concrete.
4. Steel is highly durable,
5. Steel is dimensionally accurate material produced with modern computerised technology.
6. Steel has its strength fix it did no gain strength with days as compared to concrete.
7. Earthquake resistant buildings can be made by the use of steel and it is economic also as compared to concrete.
8. Steel is biodegradable and recyclable.
9. Steel did not need curing.
10. Steel structure provide long span.
11. Steel structure result less health hazards, less waste, less Energy usage, less emissions and better Environmental work.
12. Steel buildings are designed by trained structural engineers and build in control environment so the raw material is not wasted unlike the conventional building material where the wastage is huge.
13. Braced steel frame have more base shear than unbraced frames.

14. Bracings reduce the lateral displacement of floors.
15. Axial forces in columns increases from unbraced to braced system.
16. Shear forces in columns decrease from unbraced to braced system. Diagonal braced columns undergo more shear force than cross braced.

4. DISCUSSIONS

In this review paper we studied the steel as the complete replacement of concrete. But it is suitable where steel is available abundantly otherwise transportation cost will result in costly construction. Country like Pakistan did not support steel structure because there is no steel they import it. If steel structure is not maintained properly then they will reduced 1 to 1.5 mm of thickness each year. Steel structure did not good at fire resistant they loses the strength with increase in temperature. Steel structure need proper maintenance after a regular time period. Most importantly, the usage of steel ensures more eco friendliness than other modes of construction, and due to this factor alone it is given more preference. Taking into consideration the rate of marvelous constructions, steel has proved rather favourable. With the usage of steel increasing in construction, there is no doubt that it will take over the entire construction field soon in the future.

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