

**PRE BID ENGINEERING ON QUANTIFICATION OF STEEL**

**A Dissertation Report**

**Submitted in the Partial fulfillment of the**

**Requirement for Award of the Degree**

**Of**

**MASTER OF TECHNOLOGY**

**In STRUCTURAL ENGINEERING**

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## **DECLARATION**

I hereby declare that the dissertation entitled, “**PRE BID ENGINEERING ON QUANTIFICATION OF STEEL**” submitted for the M.tech degree is entirely my original work and all ideas and references have been duly acknowledge. It does not contain any work for the award of any other degree or diploma.

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## **CERTIFICATE**

Certified that this project report entitled “**PRE BID ENGINEERING ON QUANTIFICATION OF STEEL**” submitted independent by student of School of Civil Engineering, Lovely Professional University, Phagwara are carrying out the work under the direction of me for the award of degree. The report has not been submitted to a university or institution for the award of any degree.

**Signature of Supervisor**

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## **ABSTRACT**

Now days pre bid planning is essential for better effect of costing in project. It is useful for contractors obtain the project with low cost and project execution & management as well. This research focusing on lean pre bid planning model (LPPM) and checking for bracing system used in high rise steel structure on seismic analysis. So that it will reduces the deflection occur in structure due to seismic load as well as which type members we have to use in structure, so that cost of members also get reduces. In LPPM model there is seven wastages problem that will occur in project and seven arrangement have done so that wastages get reduces. Both LPPM and analysis of steel structure ultimately gives the better result for optimiesing cost of project and time. With help of this two factors we can build up structure with optimize costing and within time as well. In future it get more opportunities to sorting out problem facing in live project construction for contractors.

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## **CHAPTER-1**

### **1. INTRODUCTION:**

Construction companies play an important role in development of country economy as well. To achieve greater economy the bidding and tendering processes is used nowadays .The method making and submitting project details for acceptance to carry out work for given cost is bidding process. The rapid growth in the last few years has found new ways for arrangements to perform pre bid. Many association made for working on this type of business, they do it pre bidding project by project. Finding opportunity according to time and forming associations this are the key role for winning contractors, in the construction area. To reach the best cost of project there is different methods are used in bidding processes. It is always better to know buyers requirement offered by the market.

It very important for construction contractor to have effective bidding methods to obtain the contracts of project from the owner. Effective pre bid plans reduces the cost, time management and labor production. More to add greater economy construction companies trying best for the structure. Total investment of construction companies is about 10% globally. Woefully the waste found in construction site is very high. For ex. 3% due early working and 46% due unnecessary work, due to waiting (32%), delay in material and tools (5%), and delay in through decision (6%). Just because of delay, unnecessary discussion, late arability of material (30%). More than (10%) to (20%) project cost is for rework. Waste from construction companies major reason for environmental pollution, from urban waste it is (10%) to (15%). So there is need to eliminate this waste from the construction project is major issue now days, with lean methods are adopted widely. According to lean theory we can reduces maximum engineering waste from project site and increases the productive value. Contractors can reduces the time, waste and increases the productivity of project by this lean theory's. Moreover for optimizing the cost of structure we are analyzing structure by seismic load as well wind load to check which type of bracing system is effective. Generally building need to be stable, there are so many member in structure are having different dimensions. Structure should be stable by considering the lateral supports that is provided by different bracing system. To avoid future problem occurs by wind velocities we analyses the structure by software. The basic problem occurred is due to wind forces it act on structure at every point like inner and outer area of structure. It's also depend on orientation of structure .This wind forces trying to structure uplifts, if suppose structural member is not that much

strong to resist the wind forces then the structure may fail. Therefore, the most important thing to be consider for structural failure is member joint, if the members is not design for loading forces they may get failure due to wind and seismic forces, like earthquake.

According to our research we taking steel structure applying this two factor to optimize the pre bid cost of structure. In LPPM we are eliminated the wastage found on project site with seven different arrangement as well, we analyses the structure with different type of bracing system so that it will reduces deflection occurred due seismic load. We are using STAAD +PRO software for seismic analysis

### 1.1 Lean Pre bid Planning Model:

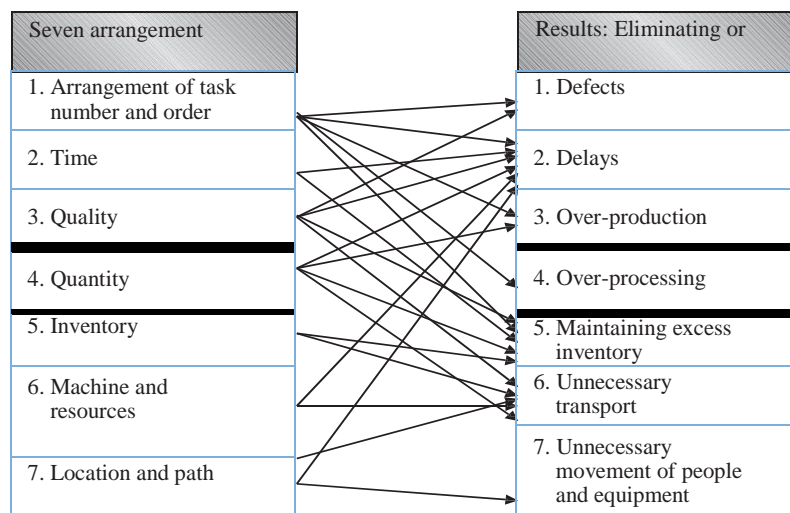
According to construction industries waste is define as losses in material, time, resources and human efforts. The problem of waste is not only reason for costing but it also affects the environment. There are wastages are found on construction projects:(1) defect due to waste, (2) delays due to waste , (3) extra production, (4) unwanted processing, (5) maintaining excess inventory, (6) unnecessary transport, and (7) unnecessary movement of people and equipment. This wastages explain it below in detail manner in tabular form.

**Table 1. Seven types of wastes in construction projects.**

Number	Waste Cause	Definition
1	From defects	unwanted material, extra handling of material,. Value generation management, management tasks
2	From delays	late entry of equipment's and material Workflows management
3	From over-production	over production even that there is no need , not call by buyers Tasks management, workflows management
4	From over-processing	unrelated steps taken in project Workflows management
5	From maintaining ex-cess inventory	Improper raw material storages, Workflows management
6	From unnecessary transport	Unnecessary disturbing flow of transport, Workflows management
7	From unnecessary movement of people and equipment	For valuable work improper management of human effort and machine efforts Workflows management

## 1.2 Steps involve in LPPM:

The propose cost of project, added expenses due to waste offered by the construction contractor. So the major things to do in the model is to eliminate this seven waste, for that defining the factors corresponding to arrangements. The seven arrangement steps in the pre bid planning process for elimination or reduction. These seven arrangement steps are (1) the arrangement of task number and order, (2) time, (3) quality, (4) quantity, (5) inventory arrangement, (6) machine and resources arrangement, and (7) location and path arrangement. With help of this seven arrangements steps, wastages can eliminated and reduces in LPPM. In LPPM the seven arrangements steps are interrelated. The steps are arrange logically and executed in the order, for the progress of lean model.



**Fig. 1. The relationships between arrangement steps and their potential waste elimination.**

## 1.3 Bracing Systems

For the high rise structure steel frame are effective to restrain lateral forces. Steel bracing system are more effective to meet the required strength and stiffness, easy to build & economic. Bracing system effective for lateral loads but it get interfere by architectural properties. Arrangement of bracing is vertically, diagonally & diagonally is more effective. Bracing system is provided to increase the stability of structure and reduces lateral displacement under the influence of lateral load.

## 1.4 Types of load acting on structure

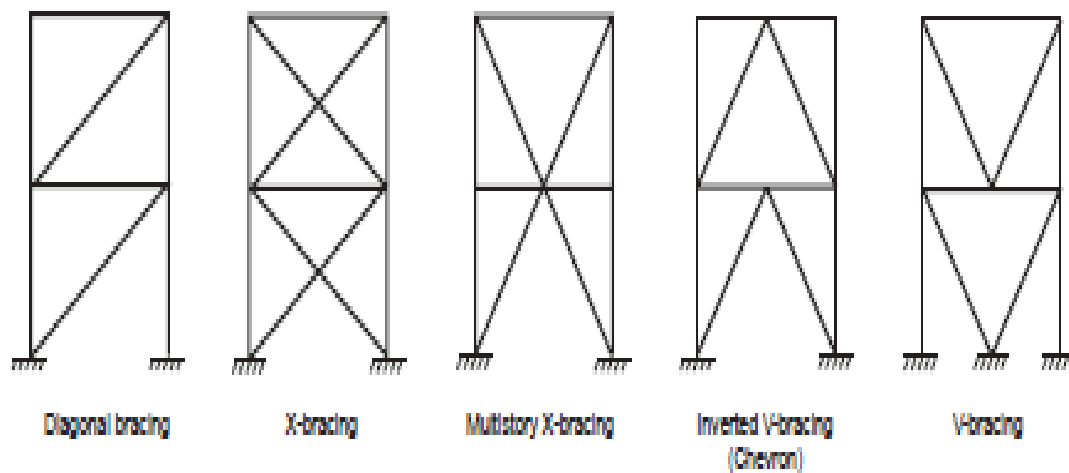
### 1.4.1 Seismic Load

The seismic load is originated from earthquake engineering. It means external force applied to building or structure and result generated earthquake turbulence.

### 1.4.2 Wind Load

Wind load is generated by the wind forces and it will be taken into consideration for construction of high rise structure.

### 1.4.3 Types of bracing system



**Figure-2: Types of concentrically braced frames**

## **CHAPTER-2**

### **LITERATURE REVIEW:**

**Thanh Long Ngo et al., (2013)** have done the case study (LPPM) Lean pre bid planning Model for construction contractors. In this LPPM they eliminated seven type of waste in manufacturing industries i.e. transformation, workflow and value generation. According theory contractors can reduce construction time, minimum cost and achieve productivity. LPPM is divided in seven type of waste is as fallows. From defects: Improper material, unnecessary material or bad quality which increases unnecessary work & processing that could affect the quality of project. From delays: between the events. From over production: production more than requirement. Waste from over processing: not proceed properly. From maintain excess inventory: improper use, improper sequences, and improper storages of raw material. From unnecessary transport: disturbing transportation part. From unnecessary movement of people of equipment: improper use of machine and manual power.

**Mallikarjuna B. n. et al., (2014)** done the analysis of steel frame by p delta analysis and compared with linear seismic analysis. They use high raised building of steel structure of having 18 stories. They used STAAD PRO software foe analysis mainly for wind load they analyzed based on steel bracing. They took five types bracing system X, Single diagonal, K and doubled diagonal. Find most effective bracing by comparing with linear statistical analysis. In high rise structure steel bracing system is effective to restrain the lateral loads. It provide for increase the stiffness and stability of structure, as well reduces lateral displacement and lateral loading. According to their analysis continuous type of bracing system. X bracing found minimum displacement 167.361 in static analysis in p delta analysis as well 294.47. So they concluded use of x bracing reduced the displacement against the lateral loading for high rise steel structure & improves the stability.

**Hussain Imran K. M. et al., (2014)** they done analysis of rigid frame with or without bracing system for seismic & wind load. Steel has some good properties like high strength, ductility, so

steel gives warning before it failure. They took five models of different bracing system, and one with without bracing system. Analyses by ETABS software to identify suitable bracing system to be obtain subjected to seismic 7 wind load. They found after analysis base shear increase up to 40% for zone III & roof displacement value decrease 45% based on results. And they concluded that X bracing system is highly effective design bracing system for steel structure against lateral loads particularly braced structure.

**Bhagatkar et al., (2015)** have reviewed the past experimental and the analytical studies done on Pre Engineered Building (PEB). It is the most important aspect to build the steel structures in a short period of span and also the results proves that structures are economic, reduces the construction cost.

**Mehendale et al., (2016)** have a done a comparison between the conventional buildings and Pre – Engineered Building and also proved that Pre-Engineered are faster, 25% less time consuming and 30 % lighter than the conventional buildings.

**Thakar et al., (2013)** have analyzed and designed a Pre-Engineered ware house of different dimensions by using Staad Pro 2007.and to know the steel quantity they change the bay spacing of structure.

**Photios G. et al., (1993)** have compared low bid and average bid methods. Project cost and schedule delays are problem faced by low bid methods. They analyses the method by mathematical formulation and simulation approach. Founded the anchorage bidding methods more effective and solve the problem of high costing of project and delay in schedule.

**Patil et al., (2016)** have compared the traditional and E- Tender all though the difference between public and private tender process and various stages of tendering. And find private

tendering & bidding is accurate and time & cost saving compare to traditional. Moreover, E-Tendering has more benefits than traditional tendering.

**Ding et al., (2011)** have analyzed effective lowest price methods on the basis of history duty and prepare the medium value methods and improved effective lowest price bidding and it improves the objective of the methods.

**Carret al., (2005)** has done estimation with making of hypothesis, methods if analysis and result, ultimately reducing the bidder number and found result increased project bid prices.

**Liu et al., (2014)** have done survey of Australian market that how the underpricing is effective in project. Contractor improves the cost of project by learning underpricing and constructor may introduce in market with underpricing strategy to compete the weaken competitors to gain profitability of contractor. It depends upon the object of underpricing.

**Mohammad et al., (2012)** have done study of bidding. Two major factors contributing for decision are key bidding factor and utilize data envelopment analysis. Compared factors on the basis of hide collected and proposed framework of bid is a result of systematic approach for bid or no-bid decision.

### **CHAPTER-3**

#### **Development of Hypothesis:**

We are taking high rise steel structure and modeling the structure with help of STAAD PRO, with different bracing system. Steel structure is analyzed for seismic and wind load. This loads are calculated as per IS code and according to zone location and other factors affecting on structure.

For the same high rise building we adopt LPPM model for eliminated wastages occurring on project site during execution. We are arrange seven steps to eliminated construction wastages.

## **CHAPTER-4**

### **4.1 Data Processing and Analysis:**

The structure we take in research is analyzed in STADD PRO, we are checking for effective bracing system for structure by giving different bracing system and reducing displacement caused by the seismic and wind load.

Now we are going to arrange the different activity with help of LPPM model to eliminate the wastages occurred on project site.

### **4.2 Data Interpretation:**

The steel structure model is analyzed using STAAD PRO and schedule using LPPM model. Thus the resultant structure has better stability with stand against wind seismic load. and wastages in construction process is eliminated using LPPM model , this two STAAD PRO and LPPM combine gives effective building with better design and construction model with optimized cost.

## **CHAPTER-5**

### **REFERENCES:**

1. Hui Ping Tserng<sup>1</sup>, Samuel Yen-Liang Yin<sup>1, 2</sup>, and Thanh Long Ngo<sup>1, 3</sup>
2. Shrunkhal V Bhagatkar<sup>1</sup>, Farman Iqbal Shaikh<sup>2</sup>, Bhanu Prakash Gupta<sup>3</sup> and Deepak Kharta<sup>4</sup>  
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5. By Photios G. Ioannou I Associate Member, ASCE, and Sou-Sen Leu.
6. Abd El-Razek, M. E., Bassioni, H. A., and Mobarak, A. M., "Causes of delay in building construction projects in Egypt," *Journal of Construction Engineering and Management*, Vol. 134, No. 11, pp. 831-841 (2008).
7. Abdullah, F., Lean Manufacturing Tools and Techniques in the Process Industry with Focus on Steel, Ph.D. Dissertation, University of Pittsburgh, Pittsburgh, PA (2003).
8. American Association of Cost Engineers (AACE), Skills and Knowledge of Cost Engineers, 3rd Ed., AACE International (1992).
9. Assaf, S. A. and Al-Hejji, S., "Causes of delay in large construction projects," *International Journal of Project Management*, Vol. 24, No. 4, pp. 349-357 (2006).
10. Atkinson, G., "A century of defects," *Building*, pp. 54-55 (1987).
11. Brooks, K. A., Adams, C., and Demsetz, L. A., "Germany construction and demolition debris recycling infrastructure: What lessons does it have for the U.S.?" Sustainable Construction, Proceeding of the First Conference of CIB TG 16, Tampa, Florida, USA (1994).
12. Burati, J. L. Jr., Farrington, J. J., and Ledbetter, W. B., "Causes of quality deviations in design and construction," *Journal of Construction Engineering and Management*, Vol.

118, No. 1, pp. 34-49 (1992).

13. DAVIDSON B. J, FENWICK R.C CHUNG B.T, “P-Delta effects in multi-story structural design” Earthquake Engineering, Tenth World conference at Balkema, 1992
14. JAGADISH J.S, TEJAS D. DOSHI, “A Study on
15. Bracing Systems on High Rise Steel Structures” International Journal of Engineering Research and Technology, Volume 2, July 2013.