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**ABSTRACT**

Quality is one of the critical factors in the success of construction projects. Quality of construction projects, as well as project success, can be regarded as the fulfilment of expectations (i.e. the satisfaction) of the project participants. The construction industry in India has been struggling with quality issues for many years. A significant amount of the budget is spent each year on infrastructure and other development projects. Since the quality outcomes of the projects are not according to required standards, faulty construction takes place.

The main purpose of this project is to first identify the factors which affect the quality of different items of work for High Rise Building. Then find out the factors which are responsible to affect the quality of work by visiting site of High rise building. By observing on the site of high rise building, main factors responsible to affect quality and photographs of quality problems are collected. From this collected data, analysis is made by ranking method to find out each factors to what amount (in%) responsible to affect Quality for high rise building. This study is carried out for only three activities such as RCC work , Brickwork and Plastering. There is a scope to consider other defects/activities occur in High Rise building. There is also scope to use other statistical methods analysis tool such as chi-square and weighted mean method (WMM) were used to rank the significance level of these factors.

**KEYWORDS:** Quality , Importance of Quality, Quality problems occur in High rise building

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**INTRODUCTION**

Construction industry plays an important role in the development of any country. The development of construction industry depends on the quality of construction projects. Quality is one of the critical factors in the success of construction projects. Improvement in the quality of construction projects is linked with quality management in the project life cycle. Although quality management at every stage of project life cycle is important but the quality management at the execution (construction) stage contributes significantly on final quality outcome of construction projects.

This project mainly focuses the importance and factors that affects the quality management in the execution (construction) phase. The project also includes visiting of some construction companies and identify the quality problems, then analyse the (major factors) quality problems and suggests some preventive measures for the improvement of quality in the execution phase of construction projects.

**CASE STUDY**

For the study, a construction site of ‘Nerkar Properties, Nashik’ which is a reputed construction company in Nashik, carrying out various on going High Rise Building projects is considered. From this, two projects which have great location i.e G+11 and G+12 which is chosen for this case study.

Project management consultant, Mr vivek patil and Mr. Vishal patil were applied impact of quality control method to control the cost and overall effect on the project.

| Description             | Project Details I                               | Project Details II                  |
|-------------------------|---|-------------------------------------|
| Site Name               | Ganesh Gunjan                                   | Ganesh Astoria                      |
| Builder                 | Nerkar Properties                               | Nerkar Properties                   |
| Site Location           | Untwadi new cidco near city centre mall, Nashik | Indira nagar near vadalagaon Nashik |
| No of Floor             | G+11  | G+12                                |
| Project Type            | Residential                                     | Residential                         |
| Type of structure       | RCC frame structure                             | RCC frame structure                 |
| Project Start           | 15/8/2014                                       | 12/6/2014                           |
| Project Completion date | 15/7/2016                                       | 15/5/2016                           |
| Project Status          | 70 % completed                                  | 60% completed                       |
| Cost of construction    | Rs 25,00,00,000/-                               | Rs 35,00,00,000/-                   |

#### Detailed of Quality problems for Project I:-

There are various quality problems occur for project I such as defects in RCC work, defects in Brickwork and defects in a Plastering work. The defects occur in RCC work such as expose of steel in beam, honeycomb structure in slab and beam and minor expansion of beam slightly on inner side. The defects occur in Brickwork such as uneven brick size and breakable bricks. The defects in Plastering work such as cracks in plaster and varying thickness of plaster.

#### Detailed of Quality problems for Project II:-

There are various quality problems occur for project II such as defects in RCC work and defects in Brickwork. The defects occur in RCC work such as cracks, improper casting of staircase, honeycomb in column and separation of concrete from bottom portion of footing. The defects occur in Brickwork such as plumbout, cracks at wall and beam junction, crack in parapet wall, uneven brick size and no offset provide in a passage.

### ANALYSIS AND RESULTS

#### 1) Analysis of Quality problems For Project I:-

##### a) For RCC defects:-

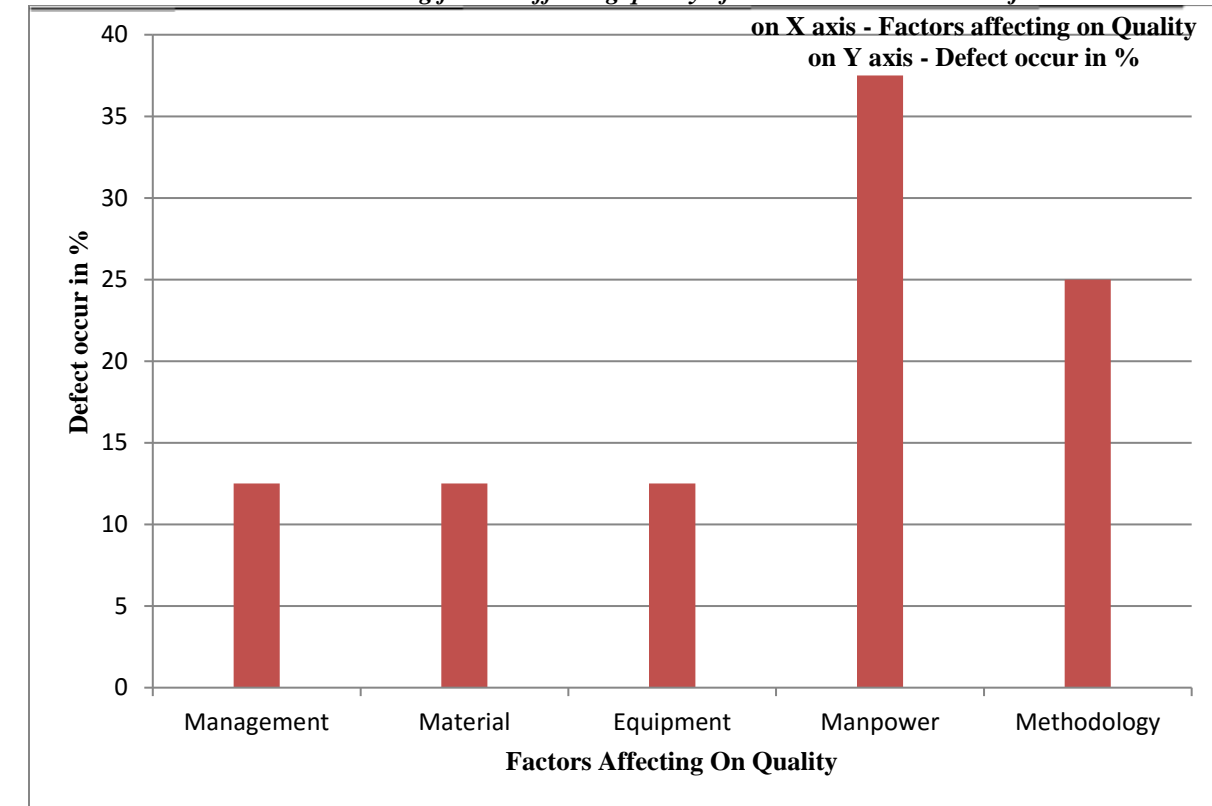
Sample calculation of Contributory factors %:-

**Table 1:- Contributory factor in % for RCC For Project I :-**

| Factors     | Honeycombing<br>33.33% | Steel Exposure<br>33.33% | Exapansion of<br>Beam<br>33.33% | Total<br>Defect | Defect in % |
|-------------|------------------------|--------------------------|---------------------------------|-----------------|-------------|
| Management  | 0                      | 0                        | 1                               | 33.33           | 12.5%       |
| Material    | 1                      | 0                        | 0                               | 33.33           | 12.5%       |
| Equipment   | 1                      | 0                        | 0                               | 33.33           | 12.5%       |
| Manpower    | 1                      | 1                        | 1                               | 99.99           | 37.5%       |
| Methodology | 1                      | 1                        | 0                               | 66.66           | 25%         |
|             |                        |                          |                                 | 266.64          | 100%        |

Above table shows that defects occur in RCC work in High Rise Building which affect the quality of construction work. These defect occur due to mainly five major factors are taken into consideration i.e Management , Material , Equipment, Manpower and Methodology. If it is responsible, it is marked with '1' and if not then marked with

**Chart 1:- Chart showing factors affecting quality of RCC work in % For Project I:-**



**b) For Brickwork defects :-**

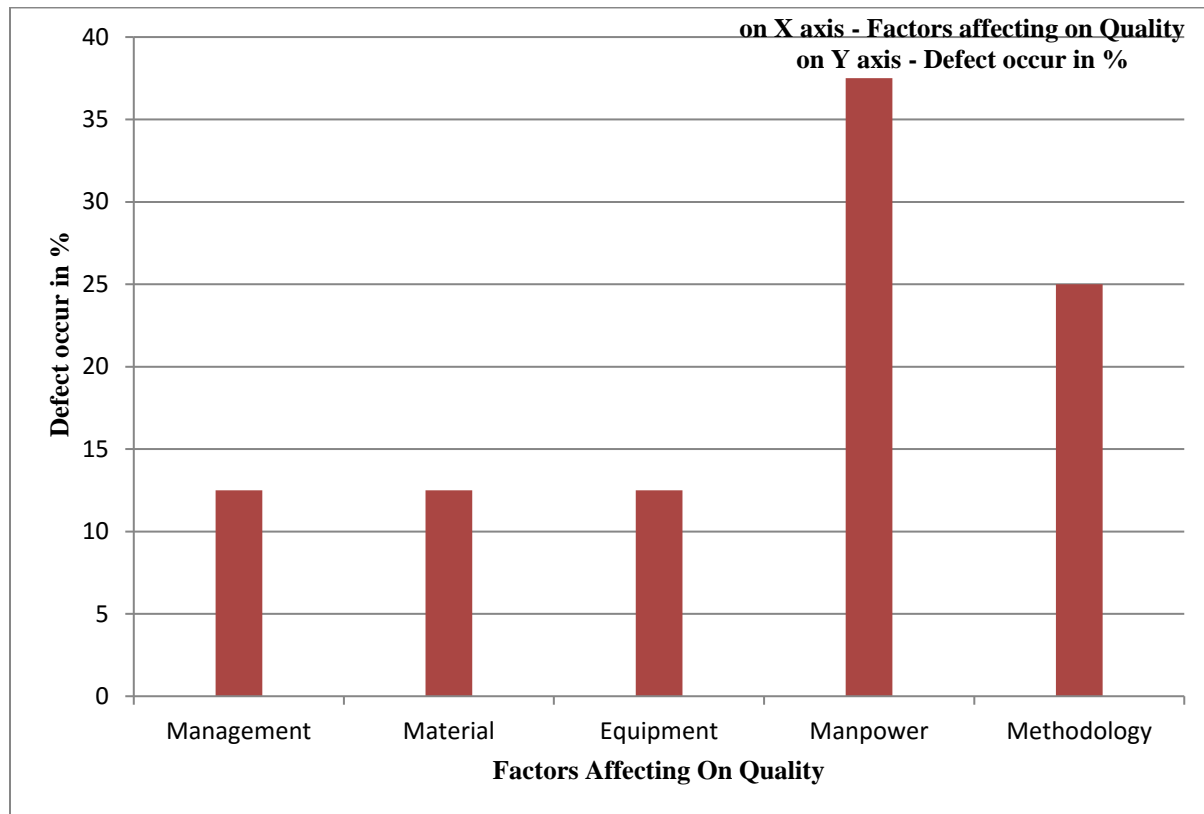
Sample calculation of Contributory factors %:-

**Table 2:- Contributory factor in % for Brickwork defect For Project I:-**

| Factors     | Uneven Brick size | Breakable Bricks | Total Defect | Defect in % |
|-------------|-------------------|------------------|--------------|-------------|
|             | 50%               | 50%              |              |             |
| Management  | 1                 | 0                | 50           | 20%         |
| Material    | 1                 | 1                | 100          | 40%         |
| Equipment   | 0                 | 0                | 00           | 0%          |
| Manpower    | 0                 | 1                | 50           | 20%         |
| Methodology | 1                 | 0                | 50           | 20%         |
|             |                   |                  | 250          | 100%        |

Above table shows that defects occur in Brick work in High Rise Building which affect the quality of construction work. These defect occur due to mainly five major factors are taken into consideration i.e Management , Material , Equipment, Manpower and Methodology. If it is responsible, it is marked with '1' and if not then marked with '0'

**Chart 2:- Chart showing factors affecting quality of Brickwork in % For Project I:-**



**c) For Plastering defects:-**

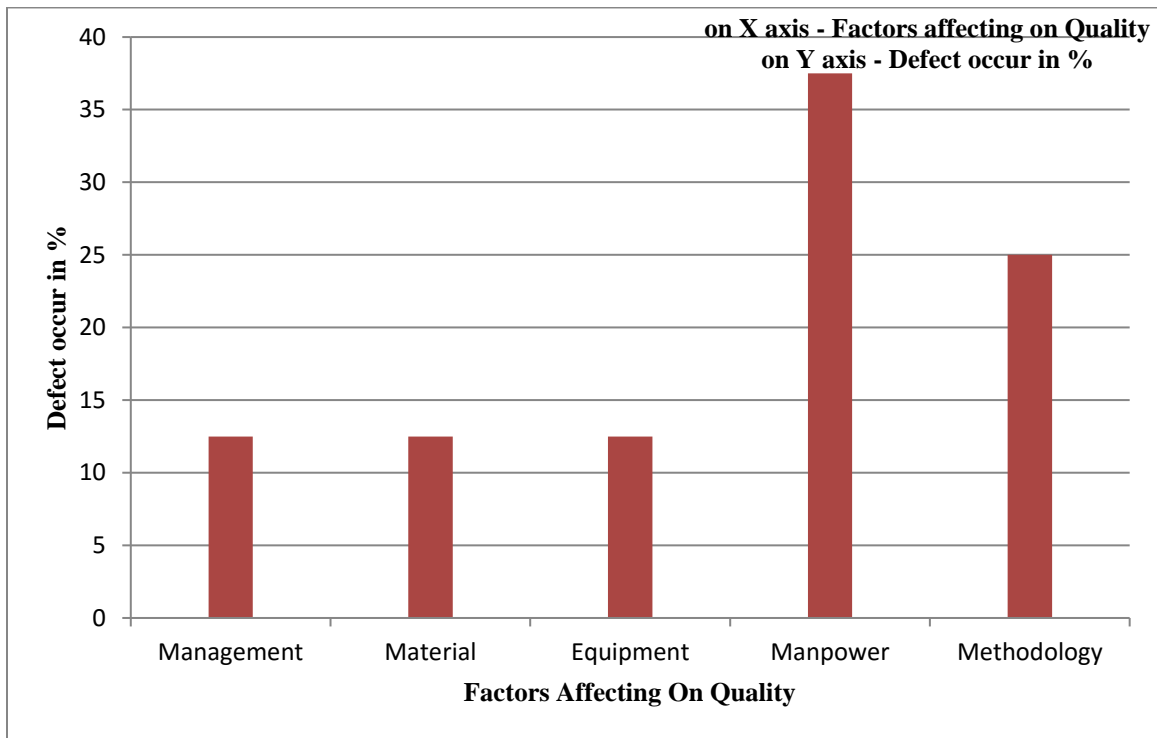
Sample calculation of Contributory factors %:-

**Table 3 :- Contributory factor in % for Plastering defect For Project I:-**

| Factors     | Cracks<br>50% | Varying thickness<br>of plaster<br>50% | Total Defect | Defect in % |
|-------------|---------------|--|--------------|-------------|
| Management  | 1             | 0                                      | 50           | 20%         |
| Material    | 0             | 0                                      | 0            | 0%          |
| Equipment   | 0             | 0                                      | 0            | 0%          |
| Manpower    | 1             | 1                                      | 100          | 40%         |
| Methodology | 1             | 1                                      | 100          | 40%         |
|             |               |  | 250          | 100%        |

Above table shows that defects occur in Plastering work in High Rise Building which affect the quality of construction work. These defect occur due to mainly five major factors are taken into consideration i.e Management , Material , Equipment, Manpower and Methodology. If it is responsible, it is marked with '1' and if not then marked with '0'

**Chart 3:- Chart showing factors affecting quality of Plastering work in % For Project I:-**



**2) Analysis of Quality problems For Project II:-**

**a) For RCC defects:-**

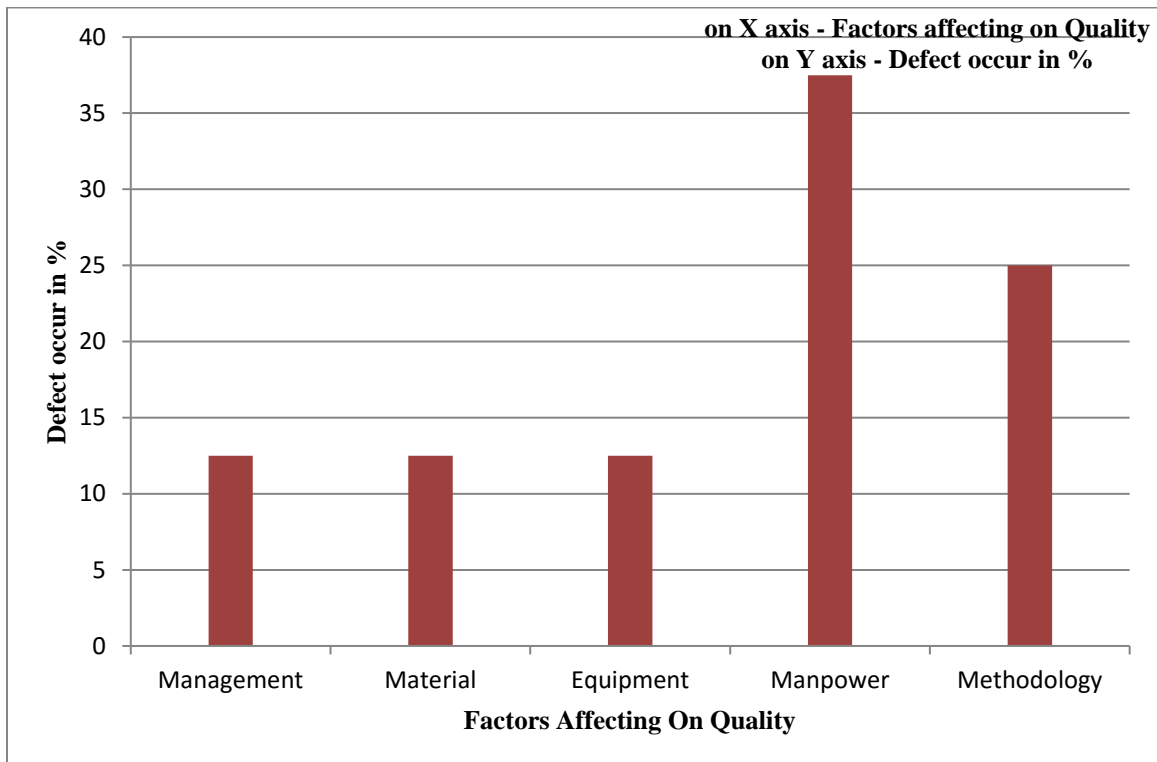
Sample calculation of Contributory factors %

**Table 4:- Contributory factor in % for RCC defect For Project II:-**

| Factors     | Cracks<br>20% | Improper casting of Staircase<br>20% | Honeycombing<br>20% | SeapARATION of concrete<br>20% | Total defect | Defect in % |
|-------------|---------------|--------------------------------------|---------------------|--------------------------------|--------------|-------------|
| Planning    | 1             | 1                                    | 1                   | 0                              | 60.00        | 33.33%      |
| Material    | 1             | 0                                    | 0                   | 1                              | 40.00        | 22.22%      |
| Controlling | 1             | 1                                    | 1                   | 1                              | 80.00        | 44.44%      |
| Money       | 0             | 0                                    | 0                   | 0                              | 0.00         | 0%          |
| Design      | 0             | 0                                    | 0                   | 0                              | 00.00        | 0%          |
|             |               |                                      |                     |                                | 180.00       | 100%        |

Above table shows that defects occur in RCC work in High Rise Building which affect the quality of construction work. These defect occur due to mainly five major factors are taken into consideration i.e Planning, Material, Controlling, Money and Design. If it is responsible, it is marked with '1' and if not then marked with '0'.

**Chart 4:- Chart showing factors affecting quality of RCC work in % For Project II:-**



**b) For Brickwork defect :-**

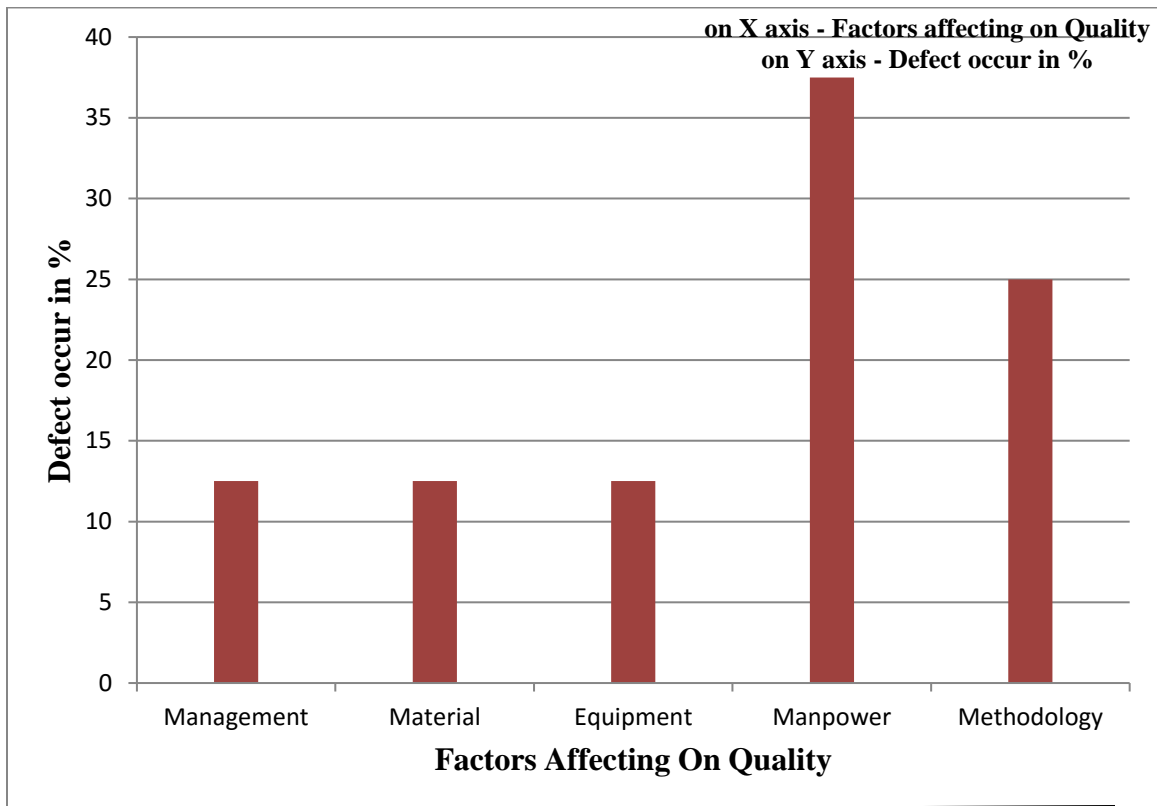
Sample calculation of Contributory factors %

**Table 5:- Contributory factor in % for Brickwork For Project II:-**

| Factors     | Plumb out<br>20% | Cracks<br>20% | Uneven Brick<br>Size<br>20% | No offset in<br>passage<br>20% | Total defect | Defect in % |
|-------------|------------------|---------------|-----------------------------|--------------------------------|--------------|-------------|
| Planning    | 1                | 1             | 1                           | 0                              | 60.00        | 30%         |
| Material    | 0                | 0             | 1                           | 0                              | 20.00        | 10%         |
| Controlling | 1                | 1             | 1                           | 0                              | 60.00        | 30%         |
| Money       | 0                | 1             | 1                           | 0                              | 40.00        | 20%         |
| Design      | 0                | 0             | 0                           | 1                              | 20.00        | 10%         |
|             |                  |               |                             |                                | 200.00       | 100%        |

Above table shows that defects occur in Brick work in High Rise Building which affect the quality of construction work. These defect occur due to mainly five major factors are taken into consideration i.e Planning, Material , Controlling, Money and Design. If it is responsible, it is marked with '1' and if not then marked with '0'.

Chart 5:- chart showing factors affecting quality of Brick work in % For Project II:-



## DISCUSSION

- 1) Quality is one of the critical factor in success of the construction work for High Rise Building. Unfortunately. Many High Rise projects failed to achieve the quality as per required for various items of the work.
- 2) In order to achieve better Quality work, adopt some programmes such as total quality management, quality assurance, quality control and quality circle in the organization.
- 3) To minimize the Quality problems through implementation of project planning, designing and controlling throughout the life cycle of projects is required.
- 4) The project I is considered as a site of Gnesh gunjan of Nerkar properties Nashik and Project II is considered as Ganesh Astoria of Nerkar properties at Nashik.
- 5) For project I, there are various quality problems occur in different items of construction work such as RCC, Brickwork and Plastering work. Mainly these defect are arises due to five factors, this five factors are Management, Material, Equipment, Manpower and Methodology to affect the Quality of different items of work for High Rise Building. These five factors are taken into consideration for further analysis.
- 6) For project I, analysis is made on the basis of above five factors such that if any one of these factors is responsible then it is termed as '1' and if not then marked as '0'. From that what amount of defect occur in % is find out and chart is plotted. This chart gives the fair idea about to show an amount for each factor is responsible of affecting the quality of high rise building.

7) For project II, there are various quality problems occur in different items of construction work such as RCC and Brickwork. Planning, Material, Controlling, Money and Design are factors responsible to affect the Quality of different items of work for High Rise Building.

8) For project II, five factors are responsible taken into consideration. Analysis is made on the basis of five factors. From that table is prepared to show the amount of defect in% for every items of construction work. From the data in table, chart is prepared.

## CONCLUSION

1) The construction process is dependent on teamwork rather than personal competitiveness which will enhance a quality building and minimal cost of maintenance in the future.

2) Quality assurance QA/QC should be implemented during the design and construction stage to avoid defects and mistake, hence quality of building should not be limited only to a particular person but the responsibilities of all parties involved in construction.

3) There should not be the Quality Control committee at the construction site of High Rise Building so that controlling should not be maintained.

4) In the construction site, finance is not available time to time so that breakable bricks are used for items of construction work.

5) In the construction site, various defects are occur due to lack of supply of material. This problem occur for big projects due to material is only supply by one supplier. Supplier have insufficient stock of material.

6) Various problems occur due to manpower in High Rise building. Manpower have lack of knowledge, lack of confidence and lack of motivation. They do not adopt proper methodology for some items of work for High Rise Building. To avoid these Quality problems, providing training programmes.

7) There should not be daily checking of stock of material.

8) Design of the construction work for High Rise building is not recheck by expert at the construction site.

9) Work according to two steps:-

- a) Proactive steps:- These steps should be carried out before starting the construction work. This consist of strategic planning , sufficient fund available, proper design process, proper management process for materials and labours, adopt training programme and quality control committee at the high rise building site.
- b) Reactive steps :- These steps should be carried out after quality problems arising on the site. This consist of Emergency Preparedness and Response, Monitoring and Measurement, Awareness and Competence, Records Keeping and Repair the Defect.

10) Many quality problems are arises due to material in High Rise building. There should be the material management department at every high rise building site so that they keep proper checking of material required time to time..

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