[Harel*, 5(4): April, 2016]

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

TOTAL QUALITY MANAGEMENT IN RESIDENTIAL PROJECT

Vinay Harel*, Aman Gupta, Kunal Shitole, Akshay Nankar, Prof. Abhaysinha Shelake
Department of Civil Engineering, RMD Sinhgad School Of Engineering, Warje-Pune, India

DOI: 10.5281/zenodo.48853

ABSTRACT

TQM means Total Quality Management. It means it is an art of managing the whole to achieve excellence. TQM is the integration of all functions and processes within an organization in order to achieve continuous improvement of the quality of goods and services . The goal is customer satisfaction. It is a application of quantitative methods and HR to improve all processes within a firm and satisfy customers needs. In residential building, quality is moderate. So it is quite useful to implement TQM . For implementing TQM in residential building, Quality Control tools like Cause and Effect Diagram, Check List and Histogram are very useful. In this project the main objective is to implement this Total Quality Management concept in residential building using QC Tools.

KEYWORDS: TQM, Quality Control Tools

INTRODUCTION

TQM is one of the most popular modern management concepts. Total Quality Management (TQM) is a system focusing on customer satisfaction through a concept of "continuous improvement". The concept of quality has existed for many years, though it's meaning has changed and evolved over time. In the early twentieth century, quality management meant inspecting products to ensure that they met specifications. In the 1940s, during World War II, quality became more statistical in nature. Statistical sampling techniques were used to evaluate quality, and quality control charts were used to monitor the production process. Quality began to be viewed as something that encompassed the entire organization, not only the production process. Since all functions were responsible for product quality and all shared the costs of poor quality, quality was seen as a concept that affected the entire organization.

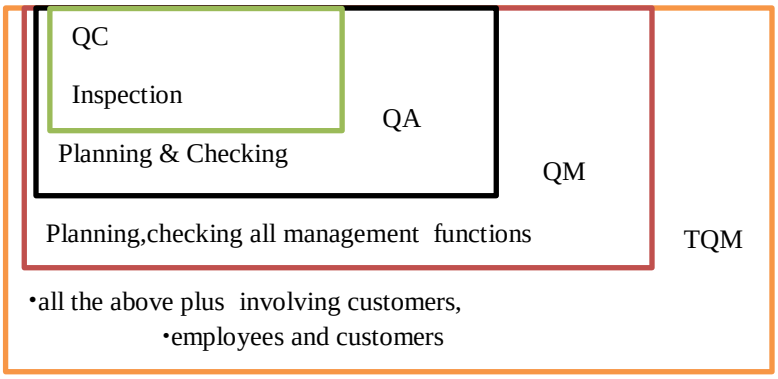

Fig.1

Quality Control is a narrow concept while TQM is a wide concept . Therefore to implement TQM , Quality Control concept should be focused as it is integral part of it. In our project we have implemented TQM on residential site using quality control tools like Checklist, Cause and Effect diagram and Histogram.

Earlier on construction site, only material quality aspects were taken into consideration for maintaining quality of construction. But with the development of TQM in recent years, human aspects and processes are also taken into consideration. Human errors causes a significant degradation in quality of construction. Human Aspects can be improved by Education and Training at all levels

Implementation, coordination, competitiveness of worker, skill level of workers, level of sub-contractor are lagging on residential site. Therefore there is need of implementation of TQM in residential project and this can be achieved by using QC tools.

Timelines showing the differences between old and new concepts of quality

TIME	EARLY 1900s	1940s	1960s	1960s and Beyond
FOCUS	Inspection	Statistical Sampling	Organizational quality focus	Customer driven quality
	⟷			⟷
	Old Concept of Quality: Inspect for quality alter production			New Concept of Quality: Build quality into the process. Identify and correct causes of quality problems.

Table No.1

TQM appears to be consistent with a move towards human resource management, not only in the emphasis on employee commitment rather than compliance, but it also identifies line managers as having a key responsibility for the management of people. Both TQM and HRM call for the involvement of top management, and in this sense can be seen as requiring a more strategic approach to the management of human resources.

Thus TQM can be implemented on Residential Site by using Quality Control Tools such Checklist, Cause and Effect Diagram and Histogram.

LITERATURE REVIEW

1. Applying Total Quality Management to the Educational Process: In This paper Robert C. Winn and Robert S. Green , explains how Total Quality Management can be applied to the educational process by considering student as a customer. If the student is identified as one of the customer ,one must try to satisfy the customer but one must be very sure to know what the customer really wants. Educational process must try to satisfy students's long term needs, not simply short term desires. TQM can be powerful tool in the educational setting though it was developed with manufacturing process in mind. The key elements to a successful implementation of TQM are: Gain support of everyone in the chain of supervision, identifying customer, focus on refining the process and use of Deming's 14 principles as a guide and checklist during implementation effort. **2. A Review on an Employee Empowerment in TQM practice:** In this paper S. Thamizhmanii and S. Hasan describes TQM as a philosophy and strategy minded customer. The word Total implies that all members of the organization make consistent efforts to achieve the objective for a customer. All employees must participate in the development of shared vision, missions, plans and in quests for continuous improvement. Empowerment is a concept that links individual strengths and competencies natural helping systems and proactive behavior to social policy and social change. Empowerment does not mean that management has no role to play. Infact management has more responsibilities. They have to monitor the skills continuously required for carrying out the ever changing complexity of jobs of the team. **3. The Effect of Total Quality Management on construction project performance Case study: Construction firm in Yemen.** Nashwan Mohammed Noman Saeed and Awad Sad Hasan carried survey of 40 companies from construction sector (30% of sample size) and the data was collected. 29 questionnaires were returned. The response rate was 72.5%. These 40 construction firms were then classified into 3 classes. From data collection it was clear that the concept of TQM in most of Yemen construction firms was absent. Data analysis showed that top management does not lean most of TQM concepts, low salary, incentives and training almost non-existent, poor standard of imported material. These results helped author to identify that TQM process was needed to improve construction project performance. In this

study TQM framework was developed. This framework demonstrates the relationship between TQM and construction project performance through examining the effect of 9 TQM constructs on 3 elemental levels of project performance.

IMPLEMENTING TQM ON RESIDENTIAL PROJECT

In this Project, for implementing TQM on the site, QC tools such as Checklist, Cause and Effect diagram and Histogram were used.
Type of construction : Residential Site
Developer : Rohan builders
Site name : Rohan Kritika
Location: Sinhgad Road, Pune.
RCC Consultant **:** J W Consultants

Fig.2. Satellite view of site

By the inspection of site, several quality issues were observed. Therefore with the help of QC tools these issues were solved and thus TQM was implemented on the site. The following QC tools were used :

1.Checklist:

Checklist consists of list of items and some indicators of how often each item on the list occurs. Checklist are tools that makes the data collection process easier by providing pre-written descriptions of events likely to occur.

2.Cause and Effect Diagram:

Cause and Effect diagram is also called the Ishikawa diagram or the Fishbone diagram. It is a tool for discovering all the possible causes for a particular effect. The major purpose of this diagram is to act as a first step in problem solving by creating a list of possible causes.

3.Histogram:

A histogram is a bar graph that shows frequency data. Histogram provides the easiest way to evaluate the distribution of data.

METHODOLOGY :

For doing this project following methodology was adopted:
1.Obtaining Site Permission.
2.Inspection of site.
3.Collection of data from the site.
4.Preparing Checklists (Blockwork, Concreting (of Beam, Slab and column) and Plastering) according to Indian Standard norms.
5.Inspection whether all the activities are going according to the checklist. If not then marking it in the checklist.
6.Preparing Cause and Effect Diagram from the Checklist.
7.Calculation of Estimation of quantities (Blockwork, Concreting (of Beam, Slab and column) and Plastering) for a particular flat and then its costing is done as per DSR rates.
8.Preparing Histogram from the costing data calculated above .
9.Final Results and Conclusions from the checklist, Cause and Effect diagram and Histogram.

In this way TQM was implemented on Residential Site with the help of QC tools (checklist, Cause and Effect diagram and Histogram).

OBSERVATIONS

1.Checklist of Block Masonry :

Sr.	Check Point	Observations		Remark
	Quality - Pre Check			
1	All GFC architectural drawing is available.	Yes☑	No☐	
2	If any changes then approved / sanction drawing is available for particular area / flat.	Yes☐	No☑	No changes .
3	Cleaning of entire floor is done.(Remove all loose material debris, wooden material, steel from entire slab area)	Yes☐	No☑	It will lead to improper Block Work as level and plumb will not be achieved.
4	Check blocks available is approved & of good quality.(Size, & good result in field test)	Yes☐	No☑	It will cause improper and poor Block Work and required Strength of block work will not be achieved .
5	All blocks were wetted properly before use	Yes☐	No☑	It will result in absorbtion of moisture from masonry and will stiffen them. Thus preventing from correct and accurate positioning of bricks and provision of secure bedding.
6	Lab report of sand is OK (Sieve analysis, silt content)	Yes☑	No☐	
7	Farma is prepared as per proportion (Follow 1:6)	Yes☑	No☐	
8	Mixing Tray is available for mortar preparation.	Yes☐	No☑	Spreading and flowing away of mortar liquid and thus proportion of mortar is disturbed.
9	All working tool are available.	Yes☑	No☐	
10	Right angle is available in good condition	Yes☑	No☐	
11	Hacking of concrete surface including Beam bottom (minimum 60 No/Sqft) or Bonding chemical applied.	Yes☑	No☐	
12	Apply rich mortar (chat) splashing on RCC	Yes☑	No☐	

	surface coming in contact with masonry.			
13	Use of rich mortar for line out (1:4)	Yes☑	No☐	
14	Line out Checked by QA team	Yes☑	No☐	
15	Provide concrete band of 4"	Yes☐	No☑	Concrete band acts as a cushion between 2 layers of wall and provides strength to the wall for effective load carrying. Thus this will not be achieved as concrete band is not provided.
16	Start line out with face line of concrete as a reference line.	Yes☑	No☐	
17	Check line out for face line, level, diagonal.	Yes☑	No☐	
18	All opening (door) is checked as per drawing.	Yes☑	No☐	
19	Check all room dimensions as per drawing			Room dimensions are as per drawing.
	Quality - Process Check			
1	Erection of door frame with necessary number of holdfast and facing in correct positions if applicable	Yes☑	No☐	
2	Check the Scaffolding is in safe condition	Yes☐	No☑	Risk to workers life.
3	Check door and window opening checked as per drawing size	Yes☑	No☐	
4	Mix Proportion for all masonry is	**1: 6**		
5	Door frame and window frame properly fix (Plumb, Line, Level etc.)	Yes☑	No☐	
6	Joint thickness not more than 15mm	Yes☐	No☑	Improper Bonding between blocks and mortar and level plumb of wall is not achieved .
7	Check block masonry for plumb, line & level at each layer.	Yes☑	No☐	
8	Concrete RCC band (coping) is provided for window sill & Parapet level.	Yes☑	No☐	

Quality - Post Check

1	All the masonry course are in plumb, Line & Level	Yes☐	No☑	It leads improper block work and wall need to constructed again with proper plumb, line and level. Thus wastage of material and increase in cost.
2	Right angle of the masonry found satisfactory	Yes☐	No☑	It leads improper block work and wall need to constructed again with proper plumb, line and level. Thus wastage of material and increase in cost.
3	Check door frame internal size @ 3 place (top, center, bottom)	Yes☑	No☐	
4	Door frame is in correct facing as per Dra.	Yes☑	No☐	
5	Racking of horizontal and vertical joints is done.	Yes☑	No☐	
6	RCC band provided at Sill / Parapet level	Yes☑	No☐	
7	Joint thickness is less then equal to 10 mm	Yes☐	No☑	Bonding between wall and plaster will be poor.
8	Metal packing provided at joint of masonry and concrete (RCC) is satisfactory	Yes☑	No☐	
9	Cleaning of masonry surface done after raking and slab surface also cleaned.	Yes☑	No☐	
10	Date of construction of masonry displayed. Curing Period is 7 Days.	Yes☐	No☑	Curing period was only 3-4 days and it will lead to shrinkage cracks and desired strength of block masonry is not achieved.
11	Curing of masonry found satisfactory	Yes☐	No☑	It will lead to shrinkage cracks and desired strength of block masonry is not achieved.
12	For External wall mortar is properly filled in except last one block at joint of masonry and concrete from outer face.	Yes☑	No☐	
13	Cleaning of entire flat up to slab surface is done on daily basis.	Yes☑	No☐	

Table No. 2

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

2.Cause and Effect Diagram (for blockwork)

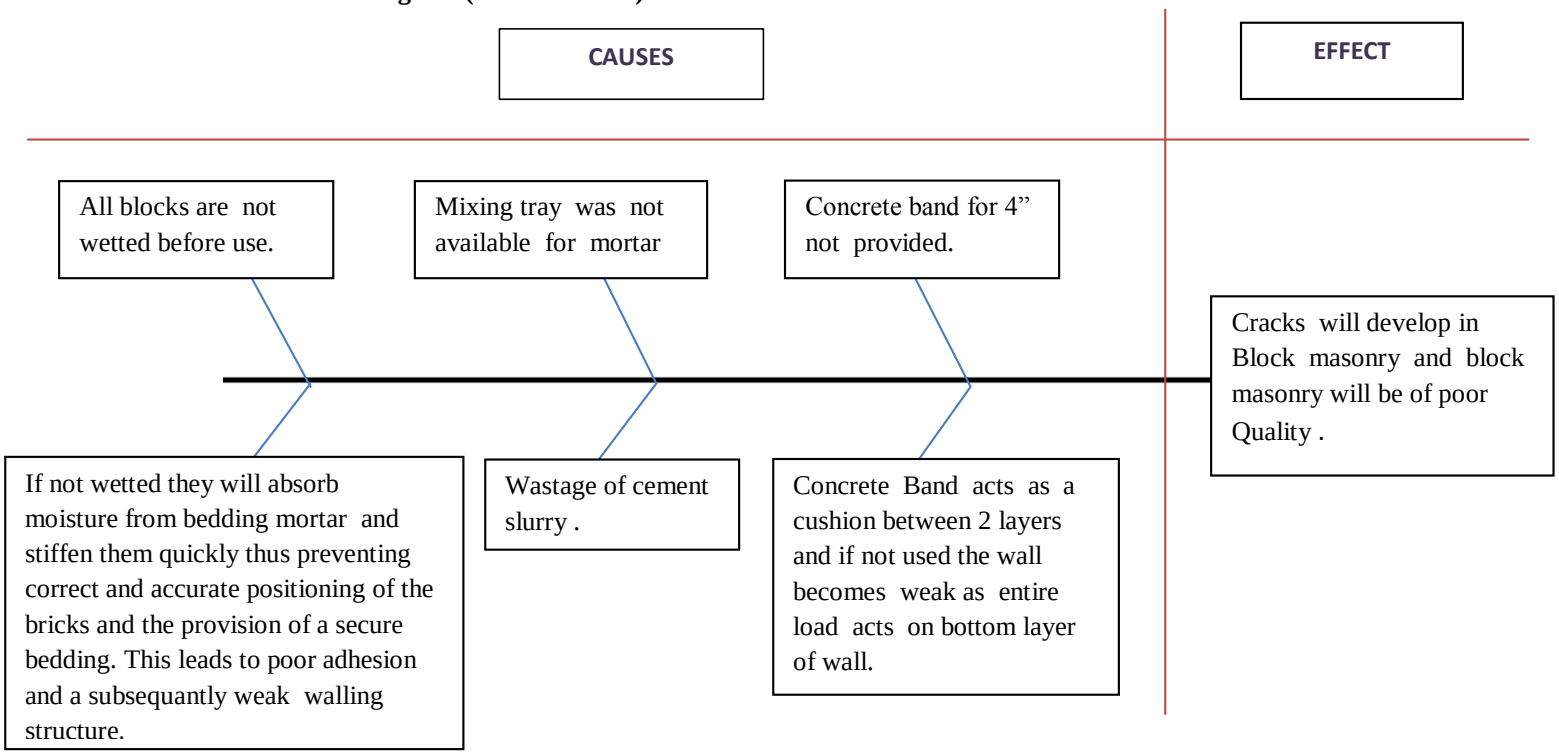

Fig. 3

3.Histogram:

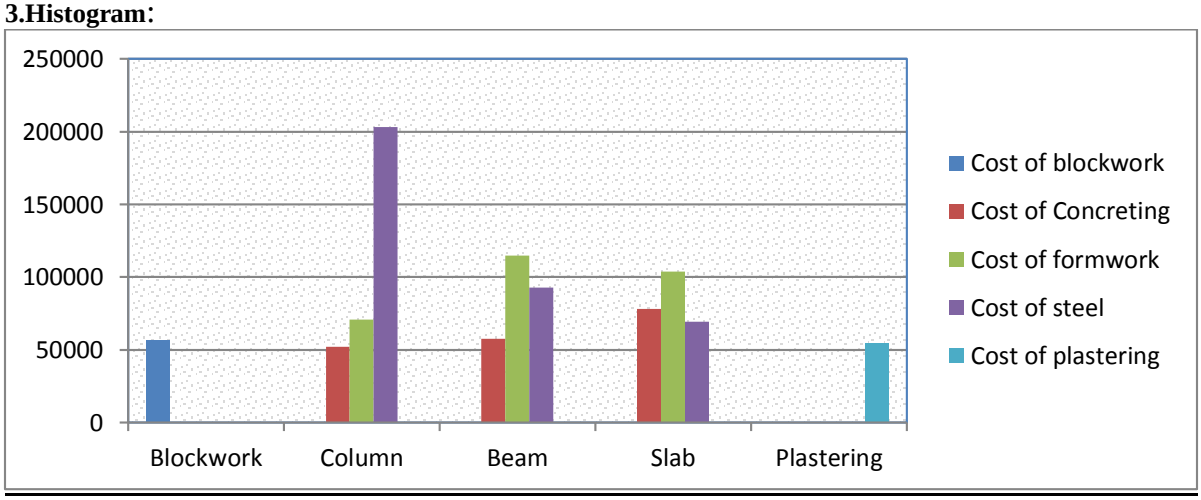

Fig. 4

Note- the cost of various activities shown in histogram were calculated by estimation and costing of a particular flat in Rohan Kritika Site.

Histogram : Bar graph of Activities Vs Cost .

Along X axis– Different Activities (Blockwork ; Concreting of Column, Beam, Slab ; Formwork of Column, Beam, Slab and Plastering (wall + ceiling) .
Along Y Axis - Cost of respective activities (in Rs).

CONCLUSIONS

1. **CHECKLIST**
   From Checklist of various activities , various Quality Issues are determined .
   Therefore these Issues can be rectified or corrected to improve the quality of construction on site.
   Thus with the help of Checklist, TQM was implemented on Rohan Kritika site.
2. **CAUSE AND EFFECT DIAGRAM**
   From the cause and effect diagram for various activities , for various causes its effect can be determined .
   Thus to minimize these effects , their respective causes should be minimized .
   Therefore Quality can be maintained on site by properly studying and thus minimizing causes which affects quality of construction.
   Thus with the help of cause and effect diagram, TQM was implemented on Rohan Kritika site.
3. **HISTOGRAM**

From histogram following conclusions were drawn:

i. Maximum cost is of steel in columns . Therefore Quality of Steel should be more focused than remaining activities.
ii. After steel , maximum cost is of formwork in Beams and Slab . Therefore Quality of formwork in Beams and Slab should also be focused .
iii. Therefore likewise different activities can be sorted out according to cost in decreasing order and their preference for maintaining quality is decided likewise. e.g the activity which has maximum cost is given first preference for maintaining its quality .
iv. Therefore by histogram, different priorities for checking qualities of various items can be set to maintain quality of construction.
v. By referring histogram , component (activity) which consumes maximum cost can be observed and by studying its cause and effect diagram its quality can be maintained.

Thus with the help of Histogram, TQM was implemented on Rohan Kritika site.

ACKNOWLEDGEMENT

We are thankful to Principal Dr.C.B.Bangal sir, HOD Prajakta Shete madam and our Project Guide Prof. Abhaysinha Shelake sir for their support .

REFERENCES

1. Hoang D.H. , “Total Quality Management (TQM) Strategy and Organizational Characteristics”,Vol. 21,No. 9,September 2010.
2. Ibrahim O.M. , “Total Quality management (TQM) and Continuous Improvements”,Volume 3,Issue 10,October 2013 .
3. Joiner T.A. , “Total quality management and performance, the role of organization support and co-worker support “, Vol. 24, Iss: 6, 2007, pp.617 – 627.
4. Lakhe R.R. & Mohanty R.P. , “Total Quality Management: Concepts, Evolution and Acceptability in Developing Economies”,Vol 11,Issue 9,Dec 1994.
5. Saeed N.M.N. and Hasan A.S., “The effect of total quality management on Construction Project performance Case Study: Construction Firms In Yemen”,Vol. (17), No. (2),2012.
6. Thamizhmanii S. & Hasan S. , “A review on an employee empowerment in TQM practice” ,Vol 39,Issue 2,April 2010.
7. Winn R.C. & Green R.S. , ”Applying Total Quality Management to the Educational Process.”,Vol. 14,No. 1, 1998,p. 24-29.