

QUALITY IMPROVEMENT IN BUILDING CONSTRUCTION USING SIX SIGMA

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Abstract - There are number of factors which affect the quality of product, time of work, cost, waste of material, etc. the objective of construction industry is to complete a project within a stipulated time, cost as per required standard and specification, minimum waste efficient use of resource. Six sigma refers to minimization of variation. Six Sigma with effective methodology. Reduced variation and eliminate causes of defects. A Six Sigma is a survey based approach is used to identify and understand the current quality. In this we are going to study on Six Sigma and quality improvement in building construction using Six Sigma principle. By using the DMAIC methodology of Six Sigma which help to identify the quality of existing structure by analyzing the defects that will suggest in DFSS for changes that required in current work.

The aim of "Quality improvement in building using Six Sigma" is to identify, analyze, the defects and understand the current quality. Also improve in the current work to achieve quality near to zero defects. Hence, "Quality improvement in building using Six Sigma" to reduce and eliminate variation which cause defect, to meet the quality standards also improve the quality and ultimately customer satisfaction.

Key Words: Six Sigma, Six Sigma concepts in Construction, Defects, Quality Improvement, DMAIC, DFSS.

1. INTRODUCTION:

Six Sigma (6σ): is a set of techniques and tools for process improvement. It was introduced by engineer Bill Smith while working at Motorola in 1980. Jack Welch made it central to his business strategy at General Electric in 1995. A six sigma process is one in which 99.99966% of all opportunities to produce some feature of a part are statistically expected to be free of defects. Six Sigma strategies seek to improve the quality of the output of a process by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, mainly empirical, statistical methods, and creates a special infrastructure of people within the organization who are experts in these methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has specific value targets, for example: reduce process cycle time, reduce

pollution, reduce costs, increase customer satisfaction, and increase profits.

1.1 THEORY BEHIND SIX SIGMA:

The Greek word, "σ" used to denote the standard deviation of set of data. The standard variation is associated with calculation of average value for a particular set of data. Sigma is nothing but a deviation from mean. Six Sigma derived from statistical distribution called "standard normal distribution". Six Sigma consider the range of lower and upper limit defect is +/- 6 sigma from the mean. Six Sigma is a statistics based methodology based on scientific method to the reduction in defect rates defined by customer for eliminates defects from every product process. Six Sigma should be recognized and celebrated for what it is: a data-driven approach to streamlining production and manufacturing. For industries and businesses outside of manufacturing, though, teams should explore more flexible project management or process improvement methodologies. For all its successes, Six Sigma can't replace human ingenuity and hard work. Look instead to the brain power in your organization, and find a methodology that works with your team's creativity and can be customized where needed

Table No 1. Overview of Six Sigma level & DPM

| Sigma | Defect Rate (PPM) | Yield | Cost Of Poor Quality | Competitive Level |
|-------|-------------------|---------|----------------------|-------------------|
| 6 | 3.4 | 99.9997 | <10% | World Class |
| 5 | 320 | 99.98 | 10%-15% | World Class |
| 4 | 6,210 | 99.4 | 15%-20% | High Quality |
| 3 | 66,800 | 93.3 | 20%-30% | Industry Average |
| 2 | 3,08,000 | 69.2 | 30%-40% | Industry Average |
| 1 | 6,90,000 | 30.9 | >40% | Non Competitive |

Six Sigma level is that where defect rate is only 3.4 ppm (defects/parts per million) in which cost of poor quality is less than 10 % and yield of product or process is up to

99.999. Six Sigma quality of any product or process is world class quality. Hence achieving Six Sigma level is nothing but achieve a product or process near to zero defects which is lead to world class quality.

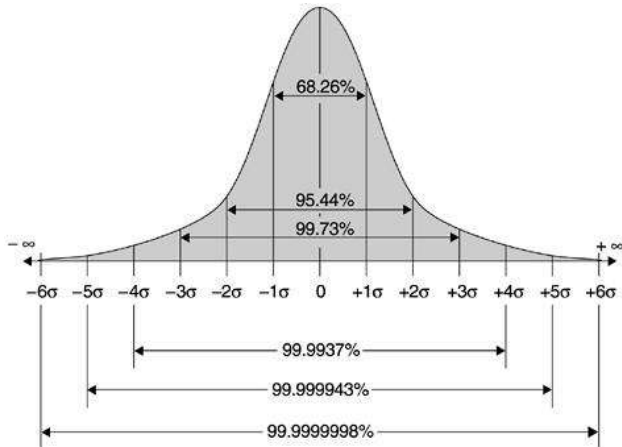


Fig No 1. Standard Deviation

For finding defect rates the following table is used. By using this table sigma level can be obtained. The sigma level is useful for finding the competitive level in the market. Also gives the suggestion to needed the required changes for improving quality as well as competitive level in market with minimizing the cost of poor quality.

2. OBJECTIVES:

1. To study & analyze common defects in building construction.
2. To reduce/eliminate defects using Six Sigma
3. To reduce wastage of resources and increase the profit.
4. To satisfied the customer goals.

3. METHODOLOGY OF PROJECT:

- 1] Identification of problem: First step of the methodology is the identification of problem and also collect the primary data of the defect of Building.
- 2] Causes & Analysis of Defects: The second step is the study of what causes of the Building occur and analysis of the defects.
- 3] Literature Review: Study the literature review and find out the technique they are used and also what their conclusions are.
- 4] Six Sigma: study and understand the concept of the six sigma and what the used of six sigma in Building.
- 5] Objectives: In this steps find out and study the objectives of Six Sigma.

6] Primary Survey: In this step the collect the all primary data.

7] Analysis: In this step used the above collected data to analysis.

8] Implementation: after the analysis data to use the best method to implement or Improve the methods.

9] Recommendation and Conclusion: after all the study conclusion is find out.

4. DATA ANALYSIS:

DMAIC: In Six Sigma we use DMAIC methodology to root out & eliminate the causes of defects. This process is used when product or process in existing.

Define: SIPOC (Supplier Input Process Output Customer) helps us to agree the boundaries of what we will be working. Customer needs and requirements, define the problem.

2. Measures: (Pie Charts) Construction activity is a set of various dependent activities. Pie chart help to identify most significant factors shows where to focus and allows better use of limited resources.

3. Analyze: Cause and Effect Diagram

It is a tool to solve problems through finding the cause of their occurrence. It helps to find all possible causes, to split into categories and organize their relationship and impact on output, and to identify opportunities for improvement.

4. Improve: Corrective action is defined as, a term that encompasses the process of reacting to product problems, customer complaints or other non-conformities and fixing them. The process includes

- a] Reviewing the problem.
- b] Finding the cause of the problem.
- c] Developing an action plan to correct the problem and prevent recurrence.
- d] Implement the plan.

5. Control: Control plan will help us to check on the various preventive measures which will help to achieve the desired result. Control plan is a description of the procedures, checks or assigned activities with respect to specifications, marking and performance. For check the preventive measures use the checklist as a control plan.

5. RESULT & DISCUSSION:

The Methods of DMAIC (Define, Measured, Analyze, Improve and Control) gives the preventive measures to avoid the

defects in construction work to achieve the desired result. By avoiding this defect a Six Sigma level quality product can be achieved in which quality is improved ultimately the aim of Six Sigma customer satisfaction is achieved.

6. CONCLUSIONS:

Quality is all about delivering to the client that project meets and exceeds their standard and specifications. Construct the project in accordance with the design details.

We had studied the various factors affecting quality of the building construction. These factors must be identified as early as possible so that the quality of construction can be improved. The methodology of six sigma principles gives systematic approach to identify and improve the current construction process. It also measure whether the quality has been improved or not. It is used to reduce and eliminate variations which cause defect, to meet the quality standards also improve the quality and ultimately customer satisfaction.

The ultimate aim of Six Sigma is to reduce variations in a process, minimize the cost of rework and achieving customer satisfaction.

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