

Evolution of Performance of Work by Check Sheet in Constructional Activities

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Abstract: - Check sheet is a one of the simpler analyzing tool in six-sigma concept, six sigma is a statistical methodology it will improve the performance of the work by adopting two concerned methodologies as DMAIC & DMADV. The main objective of the check sheet is to evaluate the performance of the work as per the requirements and standards. They can collect the required information from the observations and note down the sequence of instructions in an authorized tabular Performa. They analyze the collected data with respect to the standard specifications of the particular work. Then in the check sheet we adopt '5' point scaling, in this '5' point scaling we can predict the day to day performance of the work. In those they can be subdivided into work sheet and defect sheet, so we can compare the work sheet of an particular work with respect to defect of the corresponding work gave an idea about at which area and which location defects are occurred can be prior to predicted then substantially eliminate those defects and remove those alternative effects and improve the performance of the work and meet the standards and specifications of the specified work.

Key Words: — *check sheet, defect sheet, DMAIC, DMADV, questionnaire survey, six sigma concept.*

I. INTRODUCTION

While check sheet is a simpler analyzing tool but it requires a lot of observations and good experience in the particular field of work.

The need of check sheet in the constructional activities is to evaluate the yield of the work in the particular location, to remove the defects due to pre analyze substantial effects of work before execution, to eliminate the bad workmanship and poor execution in their performance, to achieve the reliable economy of an particular work due to reduce [wastage, poor workmanship, poor supervision, poor execution methodologies]

II. PROCEDURE TO ADOPT THE CHECK SHEET ANALYZING

Prepare a standard performa of a particular work to be executed primarily, then clearly check the work, through inspection and standards of the particular work Enumerate the defects and effects by cause and effect flow charts.

Then thoroughly inspect the work with lot of observations

Then collect the data and then analyzed with six sigma tools such as Pareto charts, bar charts, scattered diagrams.

After the entire collection of data and analyze the data and gave ranking with respect to '5' point scaling.

III. LITERATURE SURVEY

- Seungeon M.ASCE myung jinn ph.d eon son hong January 2008. Six sigma based approach on improve performance son construction operations. Case study on the reinforced bars and assembling process, ton achieve and improve performance of work and reduce viability in processing techniques to an desirable range. They indicate productivity of the based on the critical quality control and integrated with lean construction in iron reinforced bar assembling process, to reduce cycle time variations.
- Ne-ha baa-diva-student and Dr.Sneha samanth - assistant professor- Dr.D.Y.Patil institute of engineering and management research- Maharashtra. Reduce defects in r cc member by using six sigma principle.
- They discuss in the journal is completely based quality control, construction defects are occurred, and methodology of DMAIC -define-measure-analyse-improve-and control and analysis on spear mean correlation and statistic theory approach on DPMO of defects per million project critical total

quality and indices performance residential building at wagholi-pune-to find out construction defects.

- Dynamite, -student, Dr. T. Shantung Oriya –assistant professor- strait institute-department of civil engineering-Tamil -Coimbatore[implementation of the lean six sigma in construction]. November 2016-volume5- issue-11 implementing the coherent approach for Continent improve, meant and provides the conceptual methodology for successful integration of lean construction and nonvalue adding activities in sigma and waste reduction in construction industry
- Dr. satish-assistant professor and B.Allampallewar-shantan sethe Dr. D.Y. patil institute of technology pimpri-pune-maharvolume-6-issue-2-november-2017astra.
- They reefer the prominent implementation of strategic work performance and to initiate waste and reduction control and the variability occurred in construction and integrated to the existing existing management procedures of companies and implement, improve the product efficiency in the positive effect on the to eliminate unreliable difficulties
- Molly thomas, ME construction engineering and management-assistant professorl. porcela-st. Xavier catholic college of engineering-nagarcolli-INDIA Volume-5-issue-3-july-2017 Implementing of six sigma tools such as lean six sigma and Pareto charts.as the care study ready mix concrete –of 200t-and loading should be 1-2-3 loads a day.approach should be followed: Increase work effectiveness,reduce waste reduction.
- Sarath kumar,lognanathan R –ME construction engineering and management- assistant professor-department of civil engineering.And erode builder educational trust’s group institutions –tamilnadu.[evolution of six sigma concept in construction industry]-Volume-7-issue-4-april-2016.Refer ed as methodology of six sigma and implementation of six sigma based on the approach as per following: Cost reduction, cycle time reduction. Error and waste reduction, increase competent advantage. Techniques to be adopted: Positive sampling, quote sampling, snow ball

sampling. Problems to be identified: Gathering information on brick work, painting work, tile work, based on questioner survey.

- Amitha, -student, Dr. T. shanmuga priya –assistant professor- strit institute-department of civil engineering-coimbatore-tamilnadu. November 2016-volume5- issue [implementation of the lean six sigma in construction] implementing the coherent approach for continues improvement and provides the conceptual methodology for successful integration of lean construction and nonvalue adding activities in six sigma and waste reduction in construction industry

IV. 5' POINT SCALING

In these '5' point scaling we can gave a ranking by means of observations and ranking can be done numerically, based on the performance of the work.

In the '5' point scaling ranking varies from excellent to very poor they can be illustrated as for excellent [5], very good [4], good [3], poor [2], very poor [1].

They can directly indicated the how the work is to be executed and what level of efficiency is achieved of the corresponding work can be appropriately known. But, it requires an lot of back ground experience and skill full analyzers and inspector should be competent and experience in the particular field of the work. [FROM TABLE 1]

Table: 1.0 Check Sheet Of Setting Out Work Check List:
Setting Out

Name Of The Contractor:	No. Of Defect Observed:
Starting Date Of Inspection:	No. Of Observations:
Finishing Date Of Inspection:	During/After/Before/Construction:
Check List Assessment	Location:
By:	

S.No	Name Of The Work:	Excellent	Very Good	Good	Poor	Very Poor	Remarks
1.	Clearing of site	1					
2.	Substantial location of reference marks and bench marks						
3.	Allocation of elevations if any						
4.	Leveling operations						
5.	Marking of plan						
6.	Indication of foundation plan						
7.	Use of accessories						
8.	Establishing of permanent markings						
9.	Markings carried out from the						
10.	Construction of brick pillars as at the ends (markings)						
11.	Distance of permanent markings found						
12.	Distance of offsets						
13.	Measure area from (diagonals concerned)						
14.	Type of instruments used						
15.	Leveling operations						
16.	Spot levels						
17.	Bench marks if found						

The below example in the tabular form shows the name of the work as “setting out”

In those we can select the work as clear site then place the marking with respect to the numeric as ‘1’ on the excellent with respect to the corresponding work.

Then they substantially indicates the the mode particular work should carried in an expected efficiency with negligible mistakes and errors.

In the same assessment, we can evaluate the defects by comparing the above work sheet with respect to defect sheet [FROM TABLE 2]

Table: 2.0 the Sample Table Performa Shows the Defect Sheet of “Setting Out”

S.No	Defects:	Very Extreme	Extreme	Mild	Moderate	Reliable	Remarks
1.	Wrong interpretation of markings	1					
2.	Improper measuring of area						
3.	Lack of knowledge on markings						
4.	Intervening obstacles if found						
5.	Improper methodology to follow the markings						
6.	Improper placing of permanent markings						
7.	Wrong allocation of levels						
8.	Improper location of foundation trenches						
9.	Inability in measuring area						
10.	Improper location of foundation trenches						
11.	Improper location of reference marks-						
12.	Misinterpret of foundation plan						

The above example shows the defects sheet of the setting out work, in these we can place a ranking with numeric '1' on very extreme with respect to corresponding row as "wrong Interpretation of markings" they can indicates the mode of work is not carried under appropriate standards and work

Experiences many unreliable defects in execution. So we can ideal for that situation where the defect is occurred and it mitigate can be probably known and then extensively improve the performance of the work and to minimize those defects.

So check sheets gave a brief and descriptive idea about the, how the work executed, is the work is done as per the standards are not, how to minimize the defects, and how to rectify these defects, and finally how we can improve the yield of the work can be appropriately known.

However, it requires a lot/ of experience and person who inspect he should be competent in the particular field of work.

V. QUESTIONNAIRE SURVEY

The name itself represents or indicated the collect the questionnaire from the particular work and then placed in a ordered manner and then thoroughly analyzed with respect to respondent of the particular field.

A. Procedure to Be Adopt To Collect Questionnaire

- Initially inspect the work
- Collect the data with respect to observations
- Then place an statements an orderly and sequence manner
- After that place the statements in standard tabular performas check sheet
- Then pre analyze the solutions of the particular defects work
- Then access the various ways to solve the problem
- Pre test the solution
- Finally select the most appropriate one
- Finally write the illustrated solution in the"remarks"

Table: 3.0 Sample Check for Masonry Work &Table: 3.1.1. Check Sheet for Cracks in Masonry Work

S. No	Item Of Work	Very Extreme	Ext reme	Mild	Moderate	Reliable	Remarks
	MASONRY:						
1.	Failures in masonry						
2.	Wall failure						
3.	Sliding shear failure						
4.	Compression failure						
5.	Nonstructural failure						
6.	Joints and cracks						
7.	Aging						
8.	Masonry cladding						
9.	Number of part ions						

S.No	Cracks:	Very extreme	Ext reme	Mild	Moderate	Reliable	Remarks
1	Intrinsic cracking						
2	Structural cracking						
3	Diagnol cracking						
4	Vertical cracks						
5	Horizontal cracks						
6	Dormant cracks						
7	Active cracks						
8	Solitary cracks						
9	Isolated racks						
10	Patter en cracks						

Table: 3.1.2 Defect Sheet for Masonary Work

S.No	Defects:	Very Extreme	Extreme	Mild	Moderate	Reliable	Remarks
1.	Improper curing						
2.	Improper alignment						
3.	In compatibility						
4.	Adding of water						
5.	Bonding beet wen headers						
6.	Type of bond established						
7.	Defect in water cement ration if any						

Table: 3.1.3 Check Sheet for Effects in Masonary Work

S.No	Effects:	Very Extreme	Extreme	Mild	Moderate	Reliable	Remarks
1.	Dark chalky appearance						
2.	Salt patches es						
3.	Efflorescent						
4.	Feathering of edges						
5.	Fading of plaster						
6.	Dampness						
7.	Moisture flotation						
8.	Rusty marks at structures						

Table: 4.0 Check Sheet for Plastering

S.No	Name Of The Work	Very Extreme	Extreme	Mild	Moderate	Reliable	Remarks
	Defects:						
1.	Crumbling						
2.	Softening						
3.	Warping						
4.	Blistering						
5.	Bleaching						
6.	Flaking						
7.	Skirting						
8.	Effect of covered material						
9.	Cracks						
10.	Fates						
11.	Holes						
12.	Grits						
13.	Lumps						
14.	Water absorption						
15.	Efflorescence						
16.	Salt patches						
17.	Raise of ground moisture						
18.	Bad work man ship						
19.	Condensation if any						
20.	Exposition of wall						
21.	Poor drainage at the site						

Table: 4.1.1 Check Sheet for Effects in Plastering

S.No	Effects:	Very Extreme	Extreme	Mild	Moderate	Reliable	Remarks
1.	Dis integration						
2.	Warping of decay of timber						
3.	Material subjects to corrosion						
4.	Birdieing and bleaching and flaking of paints						
5.	Effect on floor coveting materials						
6.	Termite growing						

Table: 4.1.2 Check Sheet for Errors in Plastering

S.No	Errors:	Very Extreme	Extreme	Mild	Moderate	Reliable	Remarks
1.	Human error						
2.	Structural error						
3.	Design error						
4.	Specification error						
5.	Material deficiencies						
6.	Work man deficiencies						
7.	Construction deficiencies						
8.	Design deficiencies						

VI. ADVANTAGES OF CHECK SHEETS

- To prior that analyze the defects of the particular location of work to be executed
- To access the suitable solution for the particular remarked work and then improve yield of work simultaneously.
- To locate the where the defects occurred
- To illustrate the backup effects of the particular defect work
- Improve the credibility, efficiency, economy, reliability, of the work due to evaluate the day to day performance of the work by check sheets.

VII. DISADVANTAGES OF CHECK SHEETS

- Primarily it requires lot of observations
- An experienced supervisor is to be needed, and he should be competent in the particular field of work
- Requires a lot of time to analyze the data but proves an indication of where defects occurred.
- Skill full analyzers are required

VIII. METHODOLOGY

A. Define:

They defines the project goals and the scope of the work and to estimate the risks and defects and their root causes and select ad identify the problems and collect the all information regarding particular executed work they provides the provision of raw data for executed work. to define the work by using suppliers input and output system they gave brief idea about the particular work

B. Measure

They analyze the defects occurred in a particular executed work they collect the appropriate data and identify the source of the errors occur ed which relevant to the defects occur ed and then lead the project into a success full manner to meet the project goals in an appropriate and precise manner to use the six sigma tools they analyze the data and gave report to the executed work.

C. Analysing

what is the data to be collected they can properly analyzed by using six sigma principles and tools for example assortment through the check sheets they gave the report finally to pin point the what are the defects occurred and their root causes can predicted and note the at what stage of the work is unsatisfactory in their performance. Finally to compute those whole work to improve the existed work.

D. Improve

To identify the problems and accesses the potential solutions for those works for the success full implementation of the project to improve the work by using what was report that can be provide as in the case of analysis process they can provide the all information regarding improve menace in the work.

E. Control

To establish the control plan to ensure that expected improvement have been achieved to enable the work in an high level performance during execution of the work the main function and objective of the introduction of the control function is to coordinate the work with out ambiguities ans liabilities. they have several advantages regarding those function is they reduce cost due to elimination of the wastage reduce cycle time of the construction because privily to access the solution those defects occurred. to meet the customer requirements to complete the project with in the specified time and finally improve the quality the whole work.

IX. DMADV: DEFINE-MONITOR-ANALYZE-DESIGN-VERIFY

A. Define

similar to the DMAIC but based characterize of the work there will be an minor dissimilarity substantially they define the problems which are occurred during the construction and access the project goals and preferably identify the arises problems it should ultimately shows the what are the vi abilities occurred and variation occurred during processing they can be properly interpreted and provide an brief report regarding the particular work.

B. Monitor

To map out the correct process using six sigma tools such and histograms and check sheets to collect the data regarding the work to be carried out then provides a provision of two at what stage the problems are arises can frequently monitored.

C. Analyze

To pre analyze and collect the data at the monitor stage and then analyze the data by using six sigma tools they provides the provision easy access of the data interpretation to conclude the those information we can execute the work related to the design.

D. Design

It is prominent and precise stage to derive an usefully and potential product it should meet the all requirements as per the quality and quantity and also to meet those all standards and then to provide an defect less product to the customer

E. Verification:

before or during of the work to implement and verifying the solutions and improve structural imprudence of the work they effort to lead to innovative and elegant solutions during this process we need an care full examination skills to pin point each and every stage of the work to correct any defects those can be advantageous overcome by using this function at frequent intervals to monitor the work then check the work defects if any occur they can probably solved and ultimately improve the performance of the work.

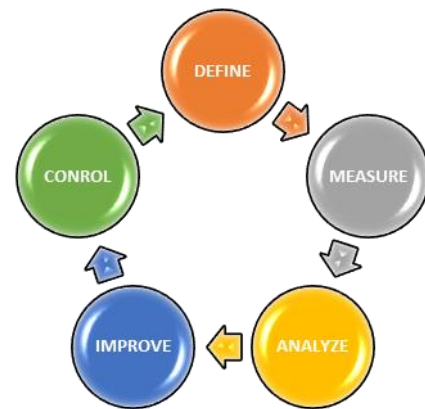


Fig: 1.0 DMAIC Methodology

X. CONCLUSION

'5' point scaling and questionnaire is are of both interrelated, in those we can collect the respondents from the questionnaire and then place it in check sheet and gave ranking with respect to '5' point scaling they can indicate the efficiency of the work to be performed, and instead of that we prior to analyze the data with respect to lot of observations and finally give an idea about efficiency of constructional activities. Because, they can indicate the where the work is defined and then corrected it priory and rectify those mistakes and improve the yield of the abruptly.

each of the objective of the work can be well known and find out the what are the root causes of the defects and how to mitigate those defects can properly analyzed.in those methodology we concerns about the the questionnaires can be posted to the engineer they give report about problems they faced during execution and what are the problems they can during construction can properly feed the data from the particular site engineer then collect those all information regarding their particular work then collected data can be probably analyzed through methodology to adopted to based on the performance of the work to be expected.

A. "5" Point Scaling

The name itself should be resembles the questionnaire can be probably analyzed by the top "5" ranking an "5" point scaling they easier to understand and interpret the results they can initially applied method of execution and compared those work with respect to defects sheet priory and then mark the method execution can be rages from the 5 to 1 points initially the 5 represents the work should be excellent and the least range is 1 point they descriptive as very poor in between the works such as 4- for the very good, 3-for good,2- for poor. then mark the each point and then count the number of counts in the last column can be counted then mean average of those numbers then it gives ultimately yield the value of the sigma.

This method of execution can be used for the ordinary and also it can be used many larger construction and above average constructions they can interpreted with respect using of the six sigma tools such as histograms as to analyze day to day performance of the work, lean sigma principle as waste elimination technique, then conclude performance of the work by using Pareto charts they ultimately shows the at what percentage of the errors occur and amount of percentage work can be successfully completed they can gave brief idea about particular executed work.

Then the report can gave the potential solution for the work to be carried out and then improve the performance of the work , then improve the productivity of the work,avoid the poor and defective work man ship, ultimately reduce construction time to pre analyze problems in an adequate manner and finally to achieve qualitative construction and achieve economy in the construction then substantially provides an provision of error free construction.

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REFERENCES

- [1]. Seung Heon Han, Myung Jin Chae, Keon Soon Im, and Ho Dong Ryu, (2008), Six Sigma-Based Approach to Improve Performance in Construction Operations , 24 (1), pp: 24-31.
- [2]. Neha Bagdiya, Sneha Sawant (2016), Reducing Defects in RCC Member by using Six Sigma Principle, 5 (2), pp: 134-136.
- [3]. .Amitha P, Dr.T.Shanmugapriya, (2016), Implementation of lean six sigma in construction: a review, 5 (11), pp: 3279-3284.
- [4]. .Sukumar. S & Radhika. R, (2017), A Study of Implementing Lean Six Sigma in Construction Industry, 3 (2), pp:940-946.
- [5]. Molly thomas, L. Porcia, (2017), Effectiveness of implementation of lean six sigma techniques in construction, 5(3), pp: 1-10.
- [6]. Ar. Priya Swami, Ar. Bhagyashree Kadiwal, (2020), Implementation of Six Sigma Methodology in Construction Industry For Quality Process Improvement, 7 (4), pp: 4285-4290.
- [7]. Aggogeri, F.,Mazzola, m, okane, j,[2009],implementing DFSS to increase the performance level of an extrusion process,5(1),pp:10-28.
- [8]. A wad, M.I, Ewing, A.,sedlak, G.,Yi, T,shanshal, Y.track [2009],track roller and idler design improvement using DFSS.Int.j, six sigma and competitive advantage,5(1),pp:29-41.
- [9]. Buyukozan, G.,ozturkcan,[2010], an integrated analytic approach for six sigma project selection, expert system with application,37(8),pp:5835-5847.
- [10]. chakraorthy, [2009],six sigma program mes, an implementation model international journal of publications economics,119(1),pp:1-16.
- [11]. Desai, D.A.,patel, M.B.[2010], six sigma implementation barriers in Indian industries survey results and case studies, Int.J.of bushiness excellence, 3(2), pp:142-162.
- [12]. Doble, M. [2005], six sigma and chemical process safety, Int.J. of six sigma and compare advantage, 1(2), pp:229-244.
- [13]. Yeung, S.M.C[2009], using six sigma SIPOC for customer satisfaction Int. J.of six sigma and competitive advantage.
- [14]. Dr. satish-assistant professor and B.Allampallewar-shantan sethe Dr. D.Y. patil institute of technology pimpri-pune-maharashtra ,]2016] , 5(4), pp:312-324.
- [15]. Mc carty, T.D & fisher, S.A.[2007], Six sigma it is not what you think, journal of coporate real estate, 9(3), PP: 187-196.