

Provision of Mobile Temporary Toilets for Construction In Case of a Multi Storeyed Building Construction Project

Sagar N. Shah, Sunil S. Pimplikar

Abstract: This research paper briefly covers parameters which play significant role on project in construction phase. To execute project smoothly and handover the project as per planned schedule is most difficult level job for a project manager. Many advance techniques are available to complete construction project with speed. Also, speed of construction work can be achieved by providing welfare facilities to the working people. The persons who are working on higher floors or the middle floors of building need to take extra effort due to absence of welfare facilities near their workplaces. this will certainly increase the duration of the project activity. If mobile temporary toilets are available near working area, then they will consume less time in these essentials. The completion date of project may get extended in the absence of these facilities because of human resource unable to focus on their work in a proper way. In this paper, an attempt is made to use the time motion study method for determining the extra times which are wasted in human circulation, due to absence of mobile temporary toilets; hence their provision is recommended.

Keywords: Managing human Resource, Gaining efficiency, Increasing productivity, Achieving profit.

I. INTRODUCTION

In olden days, the construction sites were using different types of methods and concepts for achieving their targets. Construction industries were adopting various techniques and equipment to execute smoothly as per past records. Many researchers have done their research work in this research field and have tried to bring out new pathways and different solutions. Gopalakrishnan and Brindha (2017) have discussed in their research, study on providing employee welfare facilities in construction industry, Dileep kumar (2013) has worked on inimitable issues of construction workers as a case study. Few of the researchers have invented new concept and their own design so that the construction industries can increase their growth more rapidly. Researchers like Jetter and Gerstenmeyer (2015) have been working on an innovative topic named as a next generation vertical transportation system. Researchers have certainly worked for increasing the speed of the construction work and reduce the human effort. Providing welfare facilities to the construction workers during working time will facilitate the construction project to get maximum output from them.

First objective of this research is to investigate whether the number of existing toilets provided on the ground floor for the multistoried building during construction phase are enough or not and hence offer a solution in the future.

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Second objective is to measure the impact of not providing floor wise mobile toilets for construction personnel, during work hours, in terms of time aspects. While planning layout of any construction site, planning of temporary structure must be done in such way that workers should get all facilities as near as possible. For example, distance between labour camp area and facilities area provided for them should be less. Distance between working site area and provided facilities area for the workers should be nearly equivalent so that workers do not get fatigue.

II. LITERATURE STUDY

After reviewing literature work study of the researchers, following findings were obtained. Various issues faced by construction workers on Indian sites were highlighted. (Dileep Kumar M., 2013, Prabhakar S. Chavan, 2016) Providing welfare facilities to the construction workers, to solve problems faced by construction workers daily as a solution. (Gopalakrishnan and Brindha, 2017) Improving ergonomics in improves construction labour productivity thus increasing the speed of construction. (Moselehi, Theberge and Revay, 2011) Swacch bharat mission has been focused as a one step ahead solution for environment protection which is based on solving problem of open defecation in India. (Choudhary and Gupta, 2015) To design and analyse the material handling system for reducing worker efforts as well as increase project speed. (Kulkarni and Gudhate, 2016) Overall, these research papers were discussing all the human resources internal issues struck in their life and how they were suffering with the problems generated on construction sites.

III. METHODOLOGY

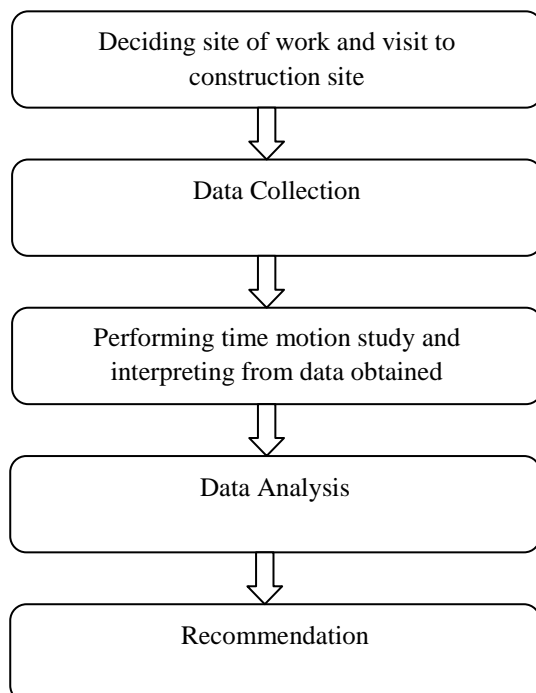
IV. FIELD DATA COLLECTION

The research project site name is a construction project, which is a 21 storeyed building located in Hinjawadi, Pune. After interacting with site workers and employees, and based on the data collection, the findings with respect to first objective are mentioned in Appendix-A



Fig.1. above image representing bird eye view of labour camp area and location of temporary toilet block on site.

There are some factors which effect on worker health during working period likewise height between two floors, total height of building, no. of steps comes while moving from lower floor (basement, parking area), location of temporary toilets blocks for the workers, route clearance and walking distance from building location to actual temporary toilets block, non-provision of flushing facilities like water tank on toilet block, energy losses, etc. so, they were facing tremendous problems due to absence of welfare facilities near working floor at the time of their working period. Above observations were arrived at by conducting time motion analysis on research project site and this study has been carried out on site by using following formula. Time motion study calculation formula:



Time motion study calculation = Horizontal movement 1 (incoming time) on working floor location + Vertical movement (incoming time) in staircase location + Horizontal movement 2 (incoming time) on ground location + Time required to fill the water bucket + Horizontal movement 2 (outgoing time) on ground location + Vertical movement (outgoing time) in staircase zone + Horizontal movement 1 (outgoing time) on working floor location + Extra time.

A. Horizontal movement 1

This movement occurs near working position i.e. on working floor area. The time required to travel from workers working area up to the staircase passage zone on same floor area is called as horizontal movement 1 in above formula. During this movement, there might be chances of obstruction coming ahead, likewise shifting of material from one flat to another flat, floor passage running activity, placing of material in passage area (i.e. creating a narrow path for movement), etc. in their flow path. In above mentioned formula, this movement is considering for the incoming time and outgoing time.

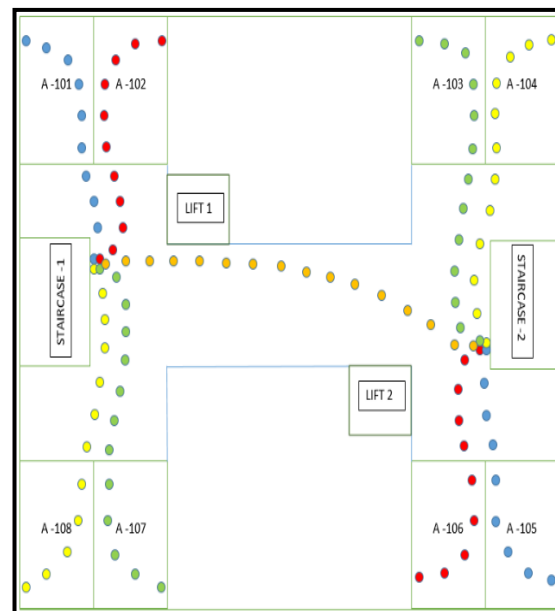


Fig.2. Time Motion Study Calculation Of Horizontal Movement 1 Done On Site By Representing Movement Pathway In Above Fig.

B. Vertical movement

Vertical movement is considering as movement from working floor staircase zone up to ground floor staircase zone. This movement occurs when the construction workers moving from working position after completion of horizontal movement 1, they were get started their next movement and in this movement they might be facing with obstruction coming ahead likewise shifting of material from one floor to another floor in the staircase passage area, props and cantilever come across movement near the slab casting area, working activity in staircase zone, etc. In above mention formula, this movement is considering for the incoming time and outgoing time.

C. Horizontal movement 2

This movement starts from staircase passage zone at ground level up to location of temporary toilet block provided for workers. Sometimes, this movement will take extra time due to absence of welfare facilities like provision of water tank on the top or side portion of toilet block. During this movement, they were facing obstruction likewise internal access road on site, ground topography condition, temporary drainage line paths, etc. In above mentioned formula, this movement is considering for the incoming time and outgoing time.

D. Additional extra time in the movement

Additional extra time is taken into consideration for this movement, depending upon category of workers (i.e. male worker or female worker), age factor, absence of facilities on labour toilet, health condition of worker, heavy workload and night shift considerations.

In real situation, daily movement of all the workers in each floor totally depends upon working task given by the supervisor or

labour contractor. This time motion study will help to determine the minimum time required for the entire journey from their working position towards temporary toilet provided on ground location and vice versa. The study considered various parameter like planning and layout of building, internal site structure and internal road access for site, arrangement of labour camp structure and route access provided in between labour quarters area, location of toilet blocks with all available facilities, temporary drainage line paths, and whether these parameters will create obstruction in the path of workers during construction period. (Refer to Appendix-B and Appendix-C)

V. RESULTS ANALYSIS

It is observed that the provided temporary toilet units are not enough as compared to worker strength on site as well as workers are facing various obstruction in their all movement path i.e. from working floor area up to ground location of temporary toilet block. It is achieved from objective 1 that, no. of toilet blocks needed are at 2.5 times presently provided. Providing welfare facilities in toilets are a must and open defecation is to be necessarily avoided.

It is achieved from objective 2 after clearly seeing through Appendix-C that, Non-productive time due to non-availability of toilet facility on working floor is 4 times greater than average time required per worker for to and fro movement to the mobile toilet if provided on the same floor and total non-productive man hours lost per day per floor is more than 6 hours and it is depending upon no. of persons performing particular task on each floor with a consideration of their age factor.

VI. CONCLUSION AND FUTURE WORK

Open defecation is necessarily to be avoided. If adequate number of toilets with proper facilities are not provided, additional construction time for activities is needed; as is evident from the results of the time-motion study presented here. Workers productivity will improve due to the provision of temporary multiple toilets for construction; in turn benefiting the industry, as well as the workers and other associated society nearby on this multi-storeyed project.

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Sr No.	Description	Field data collection
1.	Project Name.	X. (21 storeyed 4 towers)
2.	Total no. of person in the site office staff.	40 Nos.
3.	No. of toilets provided for site office staff person.	1 Nos.
4.	Workers count.	500 Nos.
5.	No. of temporary toilet units provided for workers.	16 Nos.
6.	Utilization of temporary toilet units by the workers.	6 Nos.
7.	Non-utilization of temporary toilet units by the workers.	10 Nos. (Reason : Uncleaned and not kept properly maintained by the workers on site)
8.	As per design consideration, total no. of workers per unit of temporary toilets (16 nos. toilet units).	Approx. 32 persons per unit.
9.	As per existed condition, total no. of workers per unit of temp. toilets (6 nos. toilet units).	Approx. 83 persons per unit.
10.	Absence of sanitation facilities on temp. toilet blocks.	Water tank is not provided over the workers temporary toilet blocks
11.	Daily morning problem facing by the workers on site.	Standing and Waiting in long queue for hours.
12.	Options available instead of waiting in long queuing process.	Go for open defecation

APPENDIX - A

Inference: -

- 1) No. of toilet blocks needed are at 2.5 times presently provided.
- 2) Providing basic facilities in toilet are a must.
- 3) Open defecation is to be necessarily avoided.

APPENDIX - B

Time Motion Study Details On Project																
Flat no.	Activity	No. of workers / activity	Horizontal movement -1		vertical movement -1		Horizontal movement -2						Total Time			
			Incoming time	Outgoing time	Incoming time	Outgoing time	Time required to travel distance from staircase passage to actual provided toilet block location on Ground level (sec.)						Additional time calculation			
							STAIRCASE LOCATION - 1			STAIRCASE LOCATION - 2			Staircase Location - 1	Staircase Location - 2		
							Incoming time (Initial or 1st TB)	Outgoing time (Initial or 1st TB)	Incoming time (Initial or 1st TB)	Outgoing time (Initial or 1st TB)	Incoming time (Last TB)	Outgoing time (Last TB)	Incoming time (Last TB)	Outgoing time (Last TB)	Initial TB	Last TB
A-506	P.O.P.	2	0:00:16	0:00:16	0:01:32	0:01:32	0:01:39	0:01:52	0:01:39	0:01:52	0:01:36	0:01:52	0:01:36	0:01:52	0:08:46	0:08:40
B-1403	Slab casting completed (free route for all people) (reinforcement work activity start for next upper floor)	8	0:00:17	0:00:17	0:03:42	0:03:42	0:02:38	0:02:53	0:02:38	0:02:53	0:03:08	0:03:21	0:03:08	0:03:21	0:15:05	0:16:31
C-2008	Flooring work	2	0:00:17	0:00:17	0:04:05	0:04:05	0:02:38	0:02:53	0:02:38	0:02:53	0:03:08	0:03:21	0:03:08	0:03:21	0:15:51	0:17:17
D-1904	Laying of brick batch course for waterproofing	1	0:00:17	0:00:17	0:04:49	0:04:49	0:02:17	0:02:03	0:02:17	0:02:03	0:02:29	0:02:13	0:02:29	0:02:13	0:16:10	0:17:02

APPENDIX - C

WAITING TIME ANALYSIS WITH CONSIDERING AGE FACTOR OF WORKERS					
Sr. No.	Workers description				
1.	Worker working position on project per floor	D-19, FLAT NO.1904	C-20, FLAT NO.2008	B-14, FLAT NO.1403	A-05, FLAT NO.506
2.	Total no. of workers working on same floor	14	5	26	2
3.	Max. time required to travel from that floor towards position of temporary toilet units provided on ground floor (ST.-II UPTO LAST T.B.) (Reference values taking from Appendix – B) [Hr:Min:Sec]	0:17:02	0:17:17	0:16:31	0:08:40
4.	Average age of worker (year)	27	32	45	51
5.	Waiting time calculation per worker [Hr:Min:Sec]	0:03:57	0:04:25	0:03:10	0:03:45
6.	Total time required per worker for to and fro movement for toilet location on ground floor [Hr:Min:Sec]	0:20:59	0:21:42	0:19:41	0:12:25
7.	Average time required per worker for to and fro movement to the mobile toilet if provided on the same floor. [Hr:Min:Sec]	0:04:05	0:04:05	0:04:05	0:04:05
8.	Non-productive time due to non-availability of toilet facility on the same floor per person per hour [Hr:Min:Sec]	0:16:54	0:17:37	0:15:36	0:08:20
9.	Total non-productive man hours lost per day per floor [Hr:Min:Sec]	3:56:36	1:28:05	6:45:36	0:16:40