

Implementation of lean construction practices in construction industry

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Abstract : Construction projects in India are being delivered on tight timelines and slim margins. Conventional methods of delivering projects are no longer adequate and contractors are exploring alternate delivery methods. This paper discusses the experiences of the General contractor in delivering a commercial project in Pune, Maharashtra. The scope of the project was a turnkey project of six buildings on average of six floors along with 2 canteens with underground parking to be delivered in thirty six months. Project value was 374 Crore having built-up area 296022 sq.m. with more than 2000 labours at a site.

The paper describes why Lean construction practices adapted at this site and benefits gained by adopting the Lean construction practices and how it helped eliminate flaws in activity flow. The paper also discusses how the Lean construction practices had to be adapted to account for involvement of gross root level people. The paper will also discuss how motivation helps to overcome negative mind set of stakeholders. Efforts made to create healthy working environment at site. Front line supervisors get a moral boost when they realize that management is attempting innovative methods on their projects.

Finally, how mindset of stakeholders got changed and they started demanding lean practices.

KEYWORDS: Lean construction, last planner system, ILCE, commercial, and PPC.

INTRODUCTION

We are glad to share our experience regarding implementation of Lean construction practices at our site. We implemented this concept at TCSHP- an IT park spread over 47 acres, having built up area = 340600 sq.m. This project is divided into 3 phases- Phase1, 2 &3 which includes one admin building, three services blocks, one recreational building, one utility building, two parking's with canteen, landscaping and open parking.

Project was having contract value of 407 Cr, dealing with 46 nominated contractors. Total staff of SPCL was 170 in number and labourers were more than 2000.

In such a massive project, we were facing problems regarding wastages which were near about 20-30 % of available resources, lack of co-ordination and communication at all levels. To reduce the wastages and to improve the co-ordination & communication at all levels, we were having a continuous meeting with our management and execution team. In-between that Mr. Sampath suggested about Lean construction practices and its effective use.

Lean construction is a "Way to design systems to minimize waste of materials, time, and effort in order to generate the maximum possible amount of value" which helps-

- Optimized Performance
- Less Stress

- Enhanced Values
- Waste Reduction

We, SPCL always welcome innovative managerial techniques, so our management has taken initiative under the guidance of Mr.Sampath (Secretary General of ILCE) to implement lean construction practices at our site from Oct' 13.

STAGES OF IMPLEMENTATION

Mr.Sampath explained road map of 6 months to all sub-contractors, supervisors, site engineers and all SPCL staff to implement Lean Practices Selection of Task Force Leaders.

- Selection of Team members by task force leader
- Fixing realistic but challenging target by the Task Force at the start of week for each week. Adopted “ SHALL – CAN – WILL”
- Weekly Meeting with the team
- Target fixing- and monitoring weekly

Targets were not fully relate to the global targets- “what best can be done will be done”

- And monitoring weekly.
 - Finding root cause of problems, delays.
 - Motivating sub-contractors
- Preparing monthly PPC (Percentage plan complete) Curves to track progress of work
- Preparing monthly reports on implementation of lean and feedback from team player

METHODOLOGY

The process started with a kick off meeting at our site, wherein the basic concept and ideology was shared with all. The entire process of Lean construction implementation was explained to all in steps. The concept of task force was explained to all. It was decided to have dedicated task forces working under identified task force leader. Members of the task force to include engineers, supervisors, contractor’s supervisors and other related persons for example the MEP or PMV support if for specialized job. An indicative format for recording task force meetings was shared with all-

Weekly Target Monitoring Sheet-Area wise

Site Name-TCSHP					
Weekly task force meeting from _____ to _____					
Task force no: _____					
Leader : _____ (Site Engineer)					
	Members	Designation	Members	Designation	
	ABC	Task force leader	XYZ	Subcontractor	
	BCD	Engineer	PQR	Supervisor	
	EFG	PMV	LMN	Safety officer	
Activity	Target	Achieved	Backlog	Remarks	Actions taken to avoid recurrence
Excavation	100 cum	80 cum	20cum	Low productivity	Strict supervision
Brickwork	50 Sqm	40 Sqm	10 Sqm	Bricks were not available	Material planning in advance by supervisor

We were focusing on the root cause of failure and tried to avoid the same. It was emphasized that this process is for the betterment of each individual member. It was also stressed that the buying of the process will only happen if each member finds that the process is rewarding him.

The concept should work out mainly because it is based on TEAM WORK.

There was no associated cost of software or technology. It is based upon following points-

- Equity of all participants
- Collaborative and interactive participation
- Bottom up
- Floating targets
- No blame game
- Peer Pressure on Participant
- Weak link identification
- Mind-set change
- Capturing back Childhood days

The main focus was on motivation and Appreciation.

DETAILS OF THE MEETING CONDUCTED

In the first month of implementation we considered 5 points for monitoring

- Buy in
- Communication
- Participation
- Collaboration

- Task Force Scoreboard

And started rating the above parameters on weekly basis block wise. We were monitoring three blocks S3, S2 and P2/C1 buildings. Rating was based on following criteria-

Description	Rating
Absolutely Zero	1
Needs more improvement	2
Needs improvement	3
Just below average	4
Average	5
Just above average	6
Could be better	7
Good	8
Very Good	9
Excellent	10

WEEK WISE DETAILS OF MEETINGS CONDUCTED

Week 1 – 3rd November '12 to 10th November '12:

As this concept was new to everyone, they were working as their usual way. So, we had to focus more on lean and make them aware of their duties. We explained to them the benefits of lean for them and the company. By giving many examples, we enlightened their vision towards lean. We were able to give a positive outlook towards lean concept.

Week 2- 10th November '12 to 17th November'12:

In this week, we were able to achieve the results of our efforts in the last week. In P3 building – Pour 11 & Pour 12 were completed, 2 days before the targeted date. And the target was not easy but by lean implementation, we optimized our efforts, thereby, obtained optimized results. Therefore, we appreciated the site in charge and the sub-contractors.

Appreciation of Sub-contractors and Task force leader



Week 3- 17th November’ 12 to 24th November’ 12:

Because of the appreciation given in the previous week, the sub-contractors got encouraged. In P3 Building– Pour 6 was completed 1 day before the targeted date.

Week 4- 24th November’ 12 to 1st December’ 12:

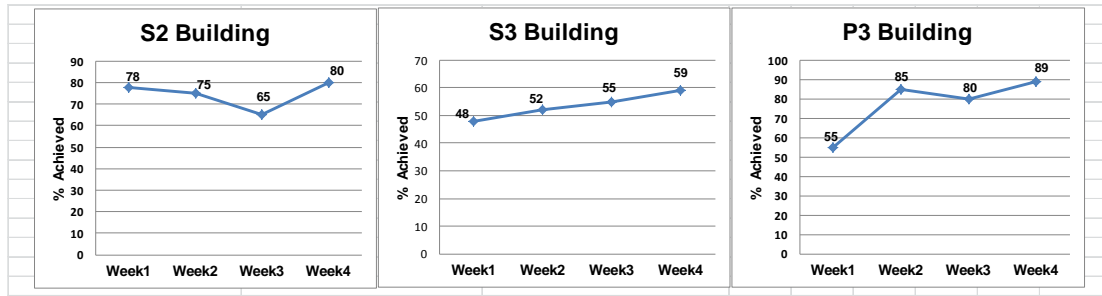
In this week I observed a healthy competition between the Building In-charges. In S3 Building, Staircase No. 4 & 6, 8 flights were casted in 10 days as compared to usual duration of 48 days which resulted in a considerable saving of 30 days. It was a very good achievement. We appreciated the In-charge & sub-contractors involved.

SCOREBOARD & PERCENTAGE PLAN COMPLETE (PPC)

Scoreboard for three blocks-Week wise

Building	Week	Buy In	Communication	Participation	Collaboration	Task Force Scoreboard
S2	Week1	5	6	4	6	6
	Week2	5	6	5	6	7
	Week3	6	7	6	6	6
	Week4	7	7	6	6	7
S3	Week1	6	6	7	6	5
	Week2	6	7	7	6	6
	Week3	6	7	7	7	6
	Week4	7	7	8	7	7
P3	Week1	8	7	7	8	6
	Week2	9	7	7	8	8
	Week3	9	8	7	8	6
	Week4	9	8	7	8	8

PPC for three blocks-Week wise



The same style is followed for 6 month adding one extra parameter of monitoring each month.

In 2nd month of implementation we focused on individual monitoring of each team player –Building In-charge, Task Force Leader, Engineer, Staff (Foreman, Supervisor) on following parameters-

- Whether he is taking initiative or not?
- Whether he is regularly attending meeting or not?
- Whether he is under peer pressure or not?

Designation	Name	Building/Block	Points			Remarks
			Initiative	Regular at meeting	Under peer pressure	
Building Incharge	Mr. Pramod Hande	S2	Yes	Yes	No	Needs motivation
	Mr. Gorge Kutty	S3	Yes	Yes	Yes	
	Mr. Pritam Rajmane	P3	Yes	Yes	Yes	
Task force leader	Mr. Abhijeet Suryawanshi	S2	No	Yes	No	Susceptible to Lean Construction Practices
	Mr. Gorge Kutty	S3	Yes	Yes	Yes	
	Mr. Ravindra Choudhary	P3	Yes	Yes	Yes	
Engineer	Mr. Ginde	S2	Yes	No	Yes	Susceptible to Lean Construction Practices
	Mr. Bagul	S3	No	Yes	No	Needs lot of motivation
	Mr. Siddhu	S3	No	No	No	Needs lot of motivation
	Mr. Subodh	P3	Yes	No	Yes	Needs motivation
	Mr. Mali	P3	Yes	Yes	No	
Foreman/Supervisor	Mr. Santosh	S2	Yes	No	No	Needs lot of motivation
	Mr. Kumar	S2	Yes	No	No	Needs lot of motivation
	Mr. Sonavane	S3	Yes	No	Yes	Needs motivation
	Mr. Pandit	S3	Yes	No	No	Susceptible to Lean Construction Practices
	Mr. Shinde	S3	Yes	No	No	Susceptible to Lean Construction Practices
	Mr. Bharti	P3	Yes	No	Yes	Needs motivation
	Mr. Lohar	P3	Yes	Yes	Yes	
	Mr. Gaikwad	P3	Yes	Yes	Yes	

In 4th month of implementation we focused on individual monitoring of Sub-contractors also along with SPCL staff to create peer pressure to gross route level. Following points used for monitoring –

- Whether he is taking initiative or not?

- Whether he is regularly attending meeting or not?
- Whether he is good at his responsibilities or not?

Designation	Name	Area of work	Points			Remarks
			Initiative	Regular at meeting	Good at his responsibilities	
Sub-Contractor	Mr. Chandradev Singh	Reinforcement	No	Yes	Yes	Needs motivation
	Mr. Arjun Prasad	Shuttering	Yes	Yes	Yes	
	Mr. Iqbal Husen	Finishing	No	No	No	Needs lot of motivation
	Mr. P.C Choudhary	Shuttering	No	No	Yes	
	Mr. Masum Khan	Concreting	No	No	No	Needs lot of motivation
	Mr. A.K Choudhary	Shuttering	No	No	Yes	
	Mr. Mahadev	Finishing	Yes	Yes	Yes	
	Mr. Devkate	Finishing	No	No	Yes	Needs lot of motivation
	Mr. Sanjeev Kumar	Concreting	No	Yes	Yes	
	Mr. Pyarelal Sharma	Shuttering	No	No	Yes	

This exercise helped a lot to create a peer pressure at each level and to make people more responsible for the work they are supposed to do.

By the end of 6 month, we started monitoring on following 8 points-

- Implementation
- Buy in
- Communication
- Participation
- Collaboration
- Kaizen
- Pull
- Task Force Scoreboard.

Scoreboard at the end of 6th month of implementation

Building/Block	Week	Implementation	Buy-in	Communication	Participation	Collaboration	Kaizen	Pull	Task Force Scoreboard
S2	Week1	8	9	8	8	8	8	9	8
	Week2	9	8	9	8	8	7	8	8
	Week3	8	9	8	8	8	8	8	8
	Week4	8	9	9	8	9	9	8	8
S3	Week1	8	9	8	8	9	7	9	8
	Week2	7	8	8	8	8	7	8	8
	Week3	7	8	7	8	7	7	8	7
	Week4	9	8	8	9	9	8	9	8
P3	Week1	8	9	7	9	9	8	7	9
	Week2	8	8	8	8	8	8	8	7
	Week3	8	8	8	8	8	8	8	8
	Week4	9	9	9	6	9	9	9	9

Points of monitoring

	In the 1 st month of implementation						
Implementation	Buy-in	Communication	Participation	Collaboration	Kaizen	Pull	Task Force Scoreboard
By the end of 6 th month of implementation							

RESULTS WE GOT

Before implementing Lean	After Implementation of Lean
Hierarchical team	Highly collaborative team
Target setting & review meetings limited to In-charges & Planning engineers.	Target Setting & review meeting also involved with site team, contractors, PMV, In-charges, Planning engineer & Librarian.
Target setting done by planning engineers.	Target setting done along with site team & top management.
Random target setting & review meetings.	Disciplined target setting & review meetings.
Team not necessarily essential	Team, Team, Team
JIT is not that important	JIT is must
Blame games	No blame game
Unhealthy & stressful working environment	Healthy & stressfree working environment
Communication and collaboration was not that effective	Effective Communication and collaboration
Flaws in activity linking	Flawless activity linking

The most important outcome is increased productivity

Activity	Productivity Before implementation Lean	Productivity after implementationLean	Percentage increase
Shuttering	1.5	2.5	40%
Reinforcement	0.5	0.8	40%
Concrete	0.7	1.1	40%

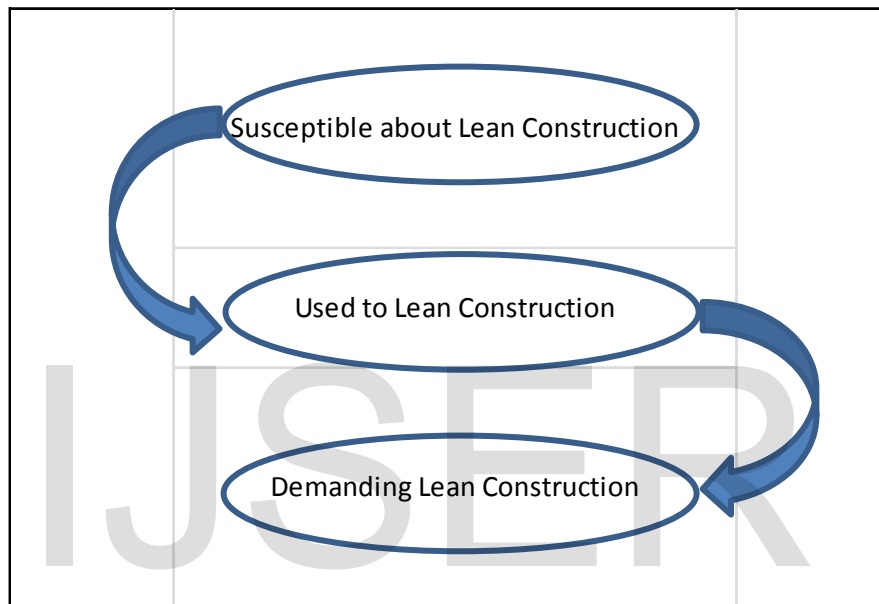
CONCLUSIONS

Implementation of Lean construction practices to construction industry is very new and in R& D stage, so there will be obviously a resistant to this concept in implantation phase. If we really want to make it a success following points has to be ensured-

- Steps to remove negativity of players about new concept
- Involvement of gross root level person in weekly meeting
- Weekly target fixing & monitoring
- Two way communication
- Appreciation-whatever small it should be

- Reinforcement of peer pressure
- Encouraging out of box thinking
- Change of mind-set of team players

This is very important as people are used to traditional working styles so they will not easily adopt the new concepts. They will definitely resist this style of working rather thinking. So here it is very important for Lean practitioner to be strong and not to lose hopes. They will definitely adopt this once they see some benefit out of it. Following figure shows how the mind-set of people gets change during this process-



Our main motto behind implementing Lean construction practices were motivation, effective communication & co-ordination at all level and thus creating healthy & stress free working environment at site level which is generally missing in construction industry and we succeeded in our motto.

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REFERENCES

This paper is solely based on our experience of implementation of Lean construction practices at one of our site as a pilot project under guidance of Mr. Sampath (Secretary General of ILCE).