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# IMPLEMENTATION OF LEAN CONSTRUCTION AS A SOLUTION FOR THE COVID-19 IMPACTS IN RESIDENTIAL CONSTRUCTION PROJECTS IN LIMA, PERU

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# AGENDA

1. Introduction
2. COVID-19 protocols in the construction sector
3. Lean construction, Last Planner<sup>®</sup> System and Safety Management
4. Research Method
5. Analysis of results
6. Conclusions

# INTRODUCTION

1. Construction industry production
2. COVID-19 Pandemic
3. COVID-19 in construction



**Figure 1.** COVID-19 capacitation previous start of work by the Head of safety

# COVID-19 Protocols in the construction sector

- Solutions and procedures implemented in Latin America and the USA:
- Modifications in the Peruvian construction scenario:



**Figure 2.** Health personnel controlling the symptoms of the workers

**Figure 3.** Disinfection of common work areas



# LEAN CONSTRUCTION, LAST PLANNER® SYSTEM AND SAFETY MANAGEMENT

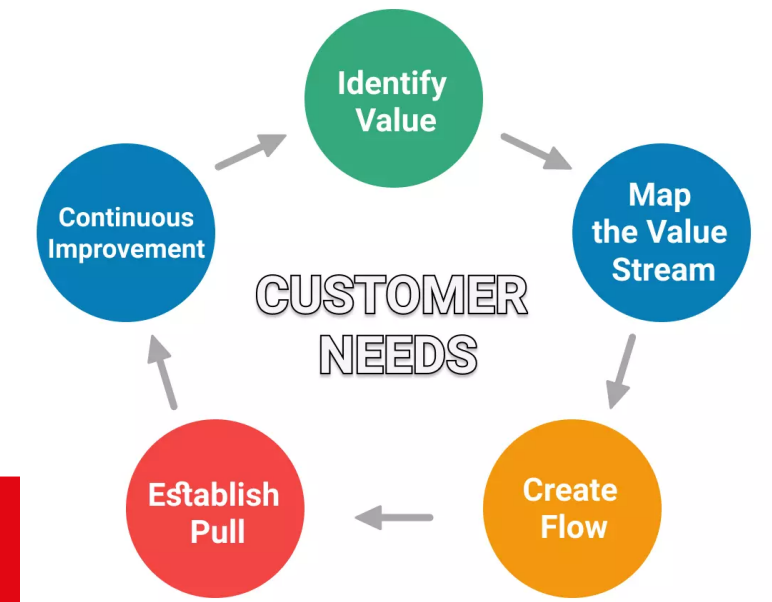
Lean Construction is a way to design a production system to minimize waste of material and time to generate the maximum possible amount of value

**Figure 4.**  
PDCA LEAN  
CONSTRUCTION



Lean construction has 5 main principles and tools such as Last Planner® System, 5S, takt time planning.

**Figure 5.**  
Lean Construction  
Principles



# LEAN CONSTRUCTION, LAST PLANNER® SYSTEM AND SAFETY MANAGEMENT

Last Planner® System is considered as a collaborative system that integrates should-can-will –did planning.

Includes the Planning cycle divided into four different levels:



**Figure 6.** Last Planner System based planning system

# LEAN CONSTRUCTION, LAST PLANNER® SYSTEM AND SAFETY MANAGEMENT

Lean Safety Management system is based on creating an environment in a workplace where there is employee motivation and reliable management.



Figure 7. 5s Safety Management System



# RESEARCH METHOD

- Case of Analysis** a project of 18 floors, 4 basements and common areas in residential housing in Lima, Peru.
- COVID-19 implementation plan at work:** Takt Time Planning according to the new sectorization and the identification of new restrictions and cause for no-completion:



**Figure 8.**

Sectorization of the structure tower pre and post COVID

Columns and Plates		Slab and Beam		Total	
Productivity index	Total (m <sup>3</sup> /day)	Productivity index	Total (m <sup>3</sup> /day)	Productivity index	Total (m <sup>3</sup> /day)
4 Sectors	13,55	4 Sectors	37,50	4 Sectors	37,50
5 Sectors	10,84	5 Sectors	40,84	5 Sectors	40,84
Percentage	20%	Percentage	20%	Percentage	20%

**Figure 9.**

Takt Planning and look ahead planning for the identification of reestrictions





# ANALYSIS OF RESULTS

1. Reduction in the probability of contagion compared with other construction projects.
2. Sectorization was deduced from 4 to 5, control the takt time plan, maintaining the performance of the personnel.
3. Last Planner® meetings realized with COVID-19 protocols.
4. Gemba walk realized by all the interested: customer, project manager and engineer staff.



Figure 10.

Pull Planning according to the new COVID-19 guidelines.



Figure 11.

Gemba Walk

# ANALYSIS OF RESULTS

4. PPC during the Pandemic was 87.67% compared with 91.74% Pre-Pandemic (5% lower)

5. 13% of the Cause of non-completion was caused by circumstances presented by the new COVID-19.

6. New restrictions identified as the number of infected, personnel with medical rest, difficulty in finding trained personnel, delay in the dispatch of materials from abroad (main China).

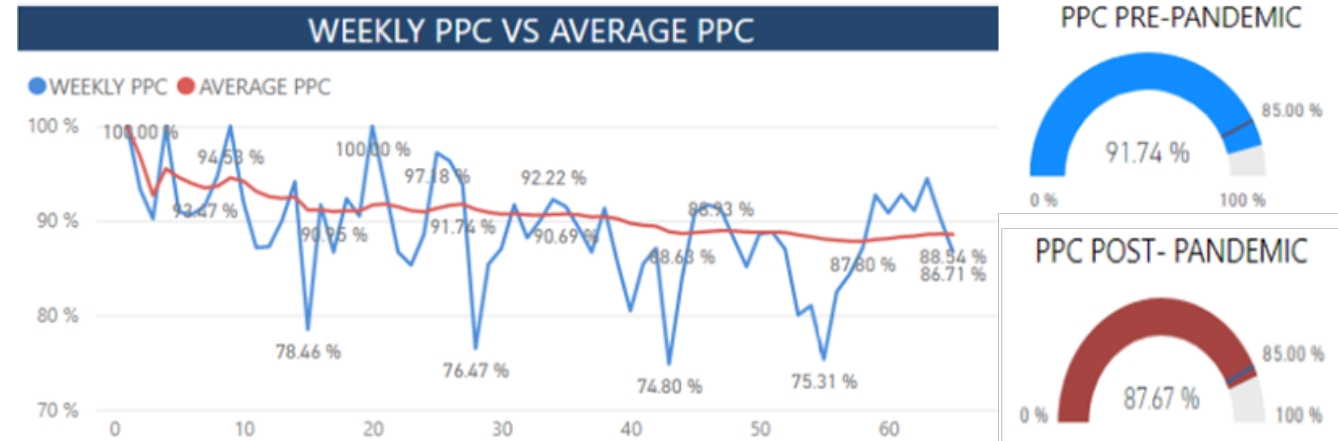
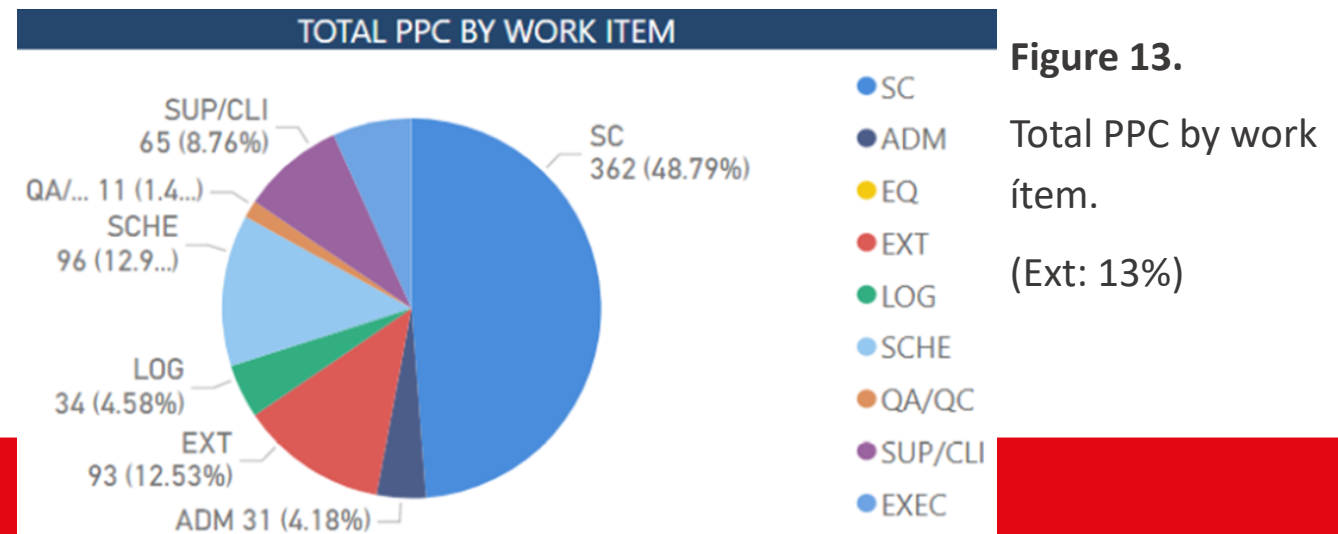


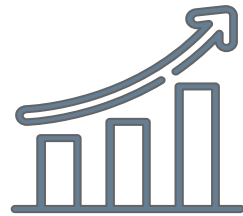
Figure 12.

PPC Pre Pandemic vs PPC Post Pandemic



# CONCLUSIONS

- The COVID-19 impact in the construction sector was significant by modifying security controls, work priorities, construction processes, control methodologies.
- It accelerated the implementation of new security protocols, the formalization of construction business in Peru



- New restrictions were discovered linked to COVID-19 as delays in the dispatch of materials, health control of work personnel, modification of the takt time planning and new causes of non-completion.
- Employing Lean Construction was the correct solution for site control in the face of the new pandemic. Since it allowed to identify new restrictions, improve communication between the parties and improve the health security system of the project. At the same time, LC helps to maintain productivity in the project studied, complying with the deadline, cost, safety and quality



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# THANK FOR YOU ATTENTION!

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