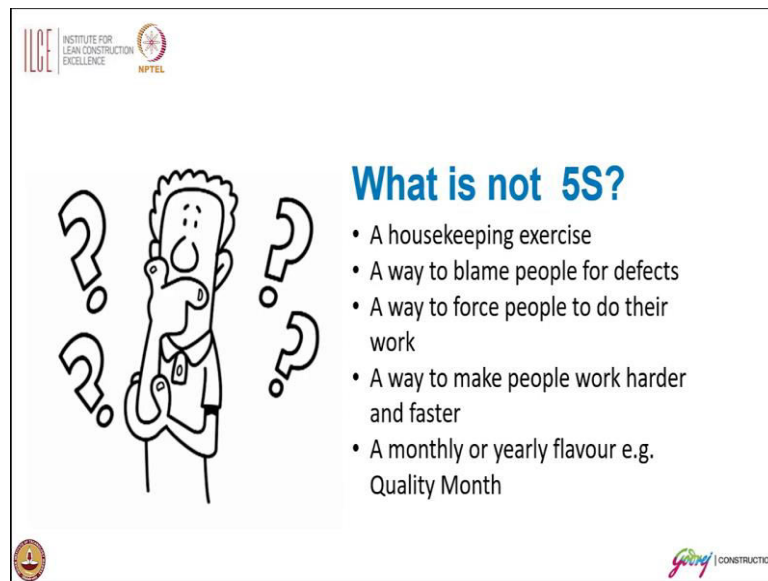


Introduction to Lean Construction
Ms Diamond Barretto
Godrej Construction
Module 1 - Lecture 50
Understand the Applications of 5S through Case Study

Hello everyone. Today I am going to take you through wonderful lean tool 5S. I am Diamond Barretto from Godrej Construction, and also, ILCE Member.

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The slide is titled "What is not 5S?" in blue text. On the left, a cartoon character with a large head and a small body is surrounded by several question marks. The character has a thoughtful expression. The slide includes logos for ILCE (Institute for Lean Construction Excellence) and NPTEL in the top left corner, and the Godrej Construction logo in the bottom right corner. A small circular logo is also present in the bottom left corner.

- A housekeeping exercise
- A way to blame people for defects
- A way to force people to do their work
- A way to make people work harder and faster
- A monthly or yearly flavour e.g. Quality Month

What first of all, let me speak about what we thought was 5S, but what is actually not 5S. So, during our engagement with our IITM professors who helped us do our Lean implementation program, we understood that 5S is not a housekeeping exercise, nor is it a way to blame people or force people to do their work or to work harder on a yearly flavour.

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So, then what is 5S and why did we at Godrej Construction want to do it? So, let me speak a little bit about it. So, 5S was developed in Japan and it enabled just in time manufacturing, most organizations adopt 5S as part of their continuous improvement program. So, why did Godrej Construction adopt 5S.

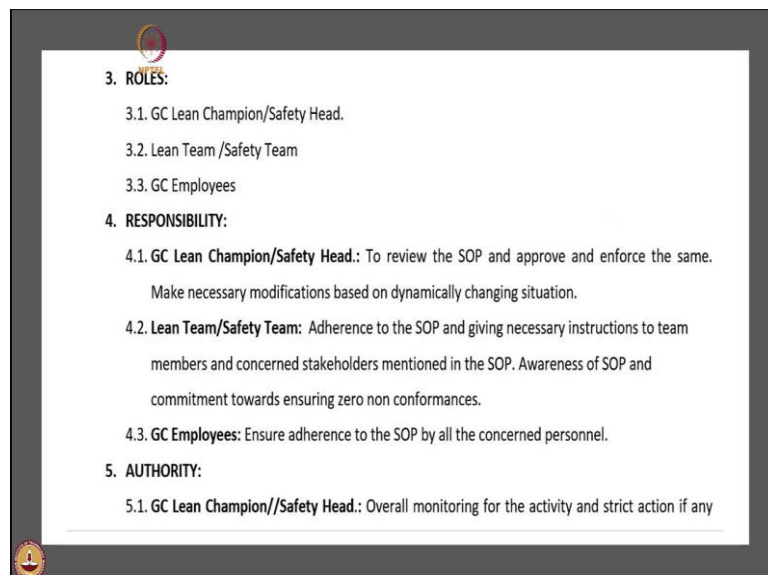
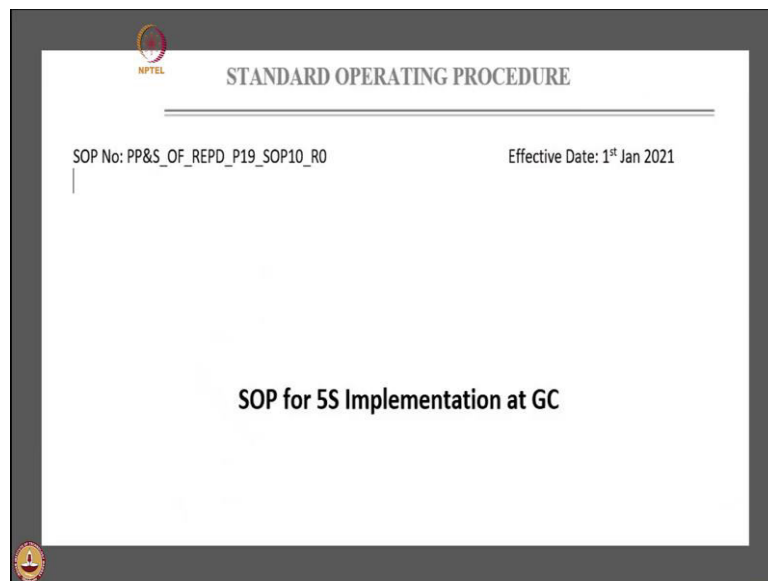
So, our Godrej Construction top management have always wanted us to have productive motivating workspaces which are cleaned, uncluttered, to reduce the safety risks, etcetera. Also, most of us our employees were not aware of the benefits of 5S because of a lack of awareness within the teams.

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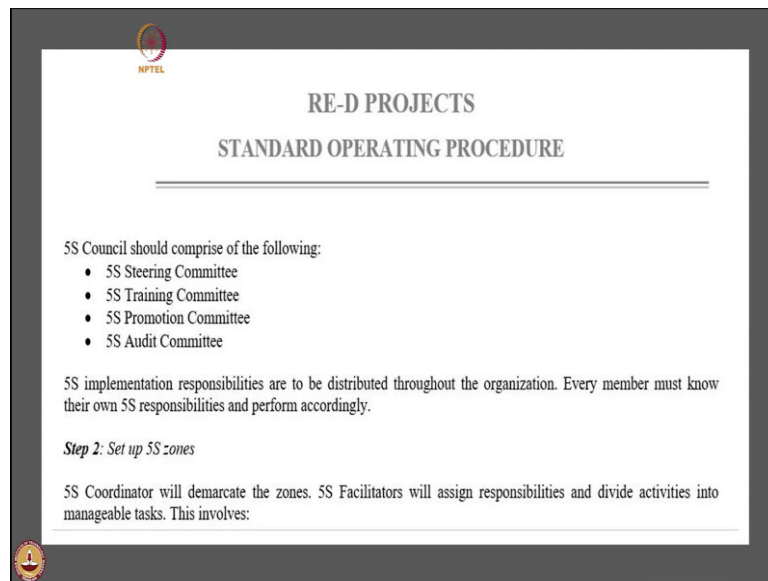
So, what is the way, how did we proceed with our 5S implementation. So, we made a clear announcement that we are now going to start the 5S journey. We also prepared and publicized a very comprehensive SOP which I will give you glimpses of later on. Also, we immediately started with training programs right from top management to workmen or operators, we set up audit teams which comprised of members from both the safety team as well as a lean team. And also, made various customized audit checklists and monitoring of the same.

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So, these are some glimpses of 5S implementation, SOP. So, you can see the clearly defined roles, responsibilities, authority mentioned there.

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RE-D PROJECTS
STANDARD OPERATING PROCEDURE

5S Council should comprise of the following:

- 5S Steering Committee
- 5S Training Committee
- 5S Promotion Committee
- 5S Audit Committee

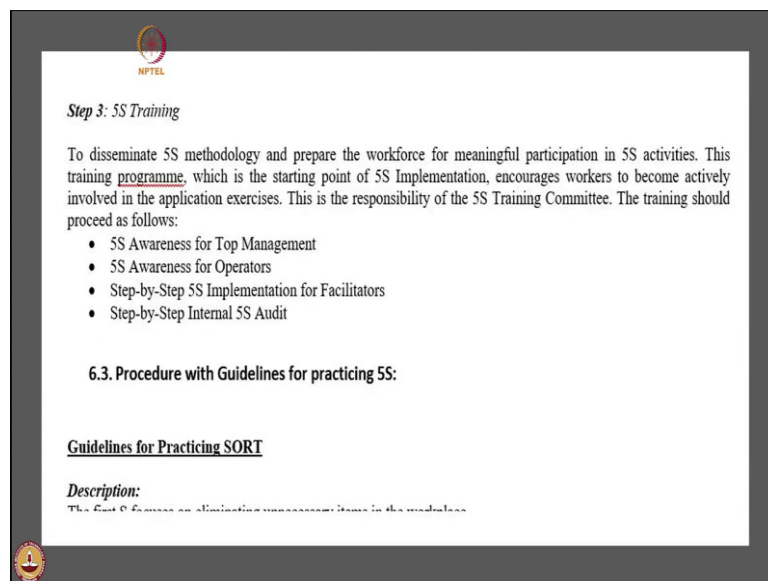
5S implementation responsibilities are to be distributed throughout the organization. Every member must know their own 5S responsibilities and perform accordingly.

Step 2: Set up 5S zones

5S Coordinator will demarcate the zones. 5S Facilitators will assign responsibilities and divide activities into manageable tasks. This involves:

Also, the 5S Council what it should consist of the steering committee, training committee promotion committee, audit committee, how the zone should be set up.

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Step 3: 5S Training

To disseminate 5S methodology and prepare the workforce for meaningful participation in 5S activities. This training programme, which is the starting point of 5S Implementation, encourages workers to become actively involved in the application exercises. This is the responsibility of the 5S Training Committee. The training should proceed as follows:

- 5S Awareness for Top Management
- 5S Awareness for Operators
- Step-by-Step 5S Implementation for Facilitators
- Step-by-Step Internal 5S Audit

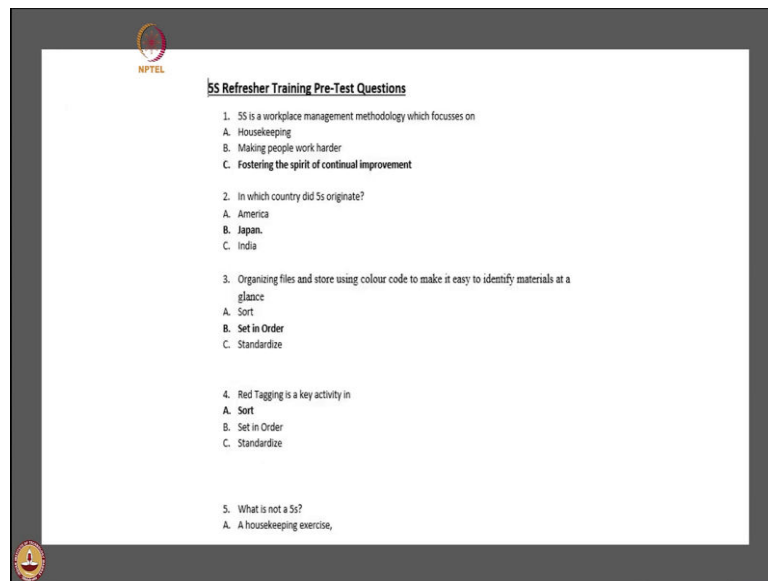
6.3. Procedure with Guidelines for practicing 5S:

Guidelines for Practicing SORT

Description:
The first 5 focuses on eliminating unnecessary items in the workplace

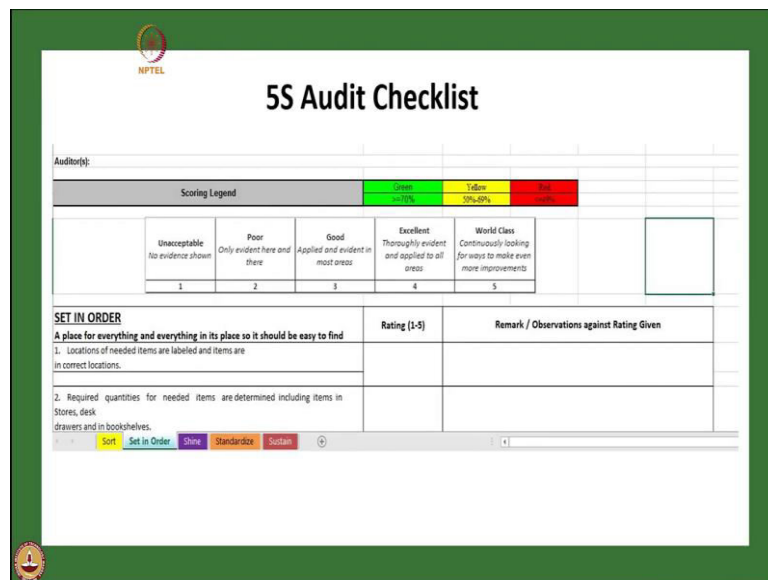
Also, how we should conduct our 5S training, a different type of training is required for top management, a different type of training is required for operators, for facilitators, audit. So, all these customized trainings we crafted out.

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And when we conducted our trainings, we also wanted to gauge what is the level of understanding of the participants during this training. So, we had this pre-test, post-test, also Google form which we developed to get a better understanding so that we can further improve our training programs.


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As a part of audit also, this is something we are wonderful checklists which have been developed by IIT Madras professors sort, set in order, shine, standard, sustain various parameters are there which should be looked for. And accordingly, there is a scoring legend which then tells you whether you fall in which category like unacceptable, poor or good,

excellent, world class. So, it makes it very easy, anybody can become an auditor with a little bit of training. So, the more number of 5S auditors the better for an organization.

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Step 1: Launch the Red-Tag Project

This is usually done by the 5S Steering Committee by creating holding areas and planning for the disposal of unwanted items using a Red-Tag form.

Step 2: Identify the Red-Tag Targets
Specify the type of items and the physical work areas to be evaluated.

Step 3: Set Red Tag Criteria


Three questions need to be asked to determine if an item is necessary

- Is it useful?
- How often is it needed?
- How much is needed?

Step 4: Attach the Tag.


The Red-Tagging event must be quick and decisive. The target scope must be completed before the 5S Launch.

Step 5: Evaluate Red-Tagged Items.




Also, then, there were some guidance given, guidance points about how we launched the Red-Tag project, Red-Tag criteria and how to attach the tag, etcetera.

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RED TAG FORM			
Department:			Section:
Area/Location:			Tagged By (named):
Classification: (Please tick)	1. Office equipment & furniture	5. Used - all Schedule waste	
	2. Raw Material & Consumables	6. E & E parts	
	3. Finish Goods	7. Mechanical Parts	
	4. Scrap	8. Others	
	Item Description		
Identification Number:	Quantity (No. of pack/s)	Estimated value (Rs)	
Reason (please tick)		Action (please tick)	
1. Not required		1. Dispose	
2. Defective		2. Return to Vendor	
3. Expired		3. Move to separate storage location	
4. Excess/Surplus		4. Repair	
5. Scrap		5. Sell	
6. Others		6. Others	
Remarks			Action Date
Proposed by:		Verified by:	
Name: _____		Coordinator's name: _____	
(Date: _____)		(Date: _____)	
Approved by (Department Head)		Additional Comments by Department Head	
Name: _____			
(Date: _____)			

A sample Red Tag Form



How to evaluate and some formats also, some guidelines to create the Red-Tag form.

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So, these are the various five stages, five important S's of 5S which I will not go through, but I will just tell how it helped us.

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So, the first S which we did was sort, so you can see the various steps in sort. So, how the sort is when in doubt move it out. So, that is exactly what red-tagging is. So, when we did red-tagging at all our project sites we identified items which are not required for various activities, we kept them aside. So, a lot of unnecessary clutter, unsafe items were removed, more space for storage of important items we got and less time for searching, this reduced our time and cost.

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ILCF INSTITUTE FOR LEAN CONSTRUCTION EXCELLENCE NPTEL

Seiri SORT

Seiton SET IN ORDER

Seiso SHINE

Seiketsu STANDARDISE

Shitsuke SUSTAIN

When in doubt, move it out

A place for Everything and Everything in its place

- Put names and numbers on all jigs and tools.
- Store tools beside the machine with which they will be used according to sequence of work operations.
- Do not stack items together, use rack or shelf.
- Use small bins to organise small items.
- Use colour for quick identification of items.
- Label clearly each item and its storage area (Visual Control)
- Create tool boards.

Gomy CONSTRUCTION

The next S is Seiton or set in order. In this all these points which are there some tips guidelines how we did like we created tool boards we labelled each and every item, visual controls had dustbins, bins, stacking items, shelves we ordered and all these things we did. So, this led to better ergonomics stress-free environment. Also, lot of the excess time for motion, searching, etcetera was eliminated.

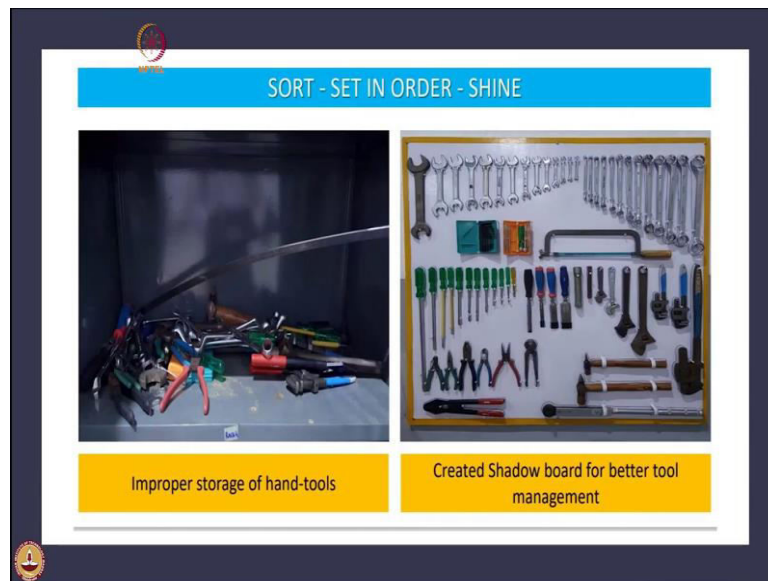
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NPTEL SORT - SET IN ORDER - SHINE

Random storage of materials

Unwanted material sorted out

Gomy CONSTRUCTION



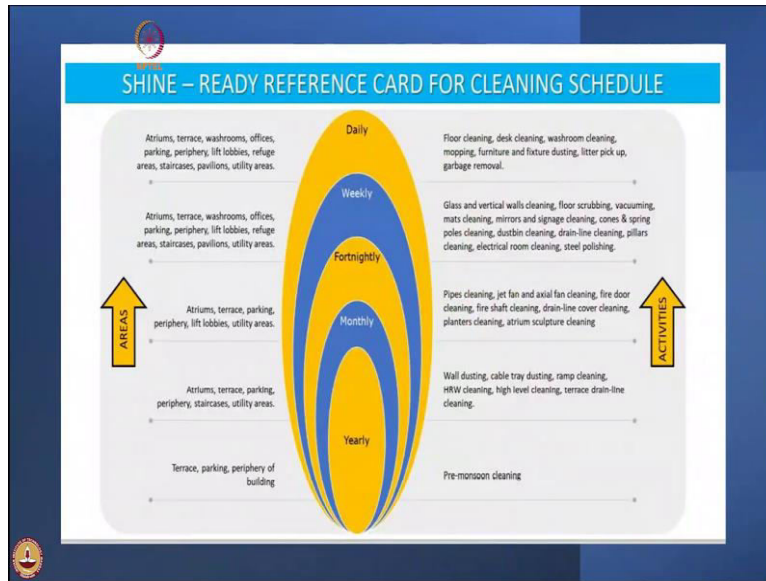
So, these are some pictures of set in order. So, you can see how we created shadow boards, improper storage of tools and tools was there before.

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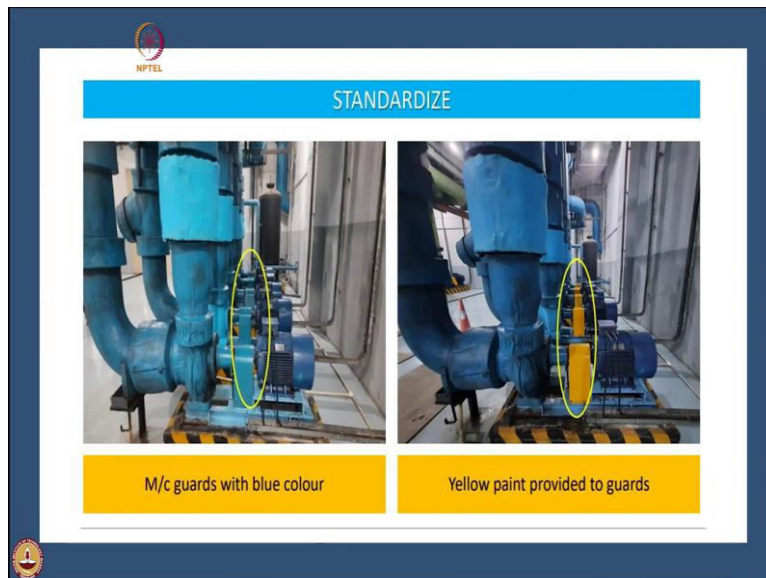
Now, the next is, now this is shine. So, whatever has been done in the first two S's, now clean and inspected, inspect through cleaning, make the place shine. So, as a part of this what we did at Godrej Construction is we created a lot of in addition to cleaning what we are saying delegating cleaning assignments, what is to be cleaned, methods, which tools have to be used and how to. We also did a lot of lighting in this areas, dark spaces you know, good elimination, ventilation, etcetera was created in this stage.

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Also, a ready reference card like this we prepared for the cleaning schedule which was very easy to understand, which areas and which activities to be done.

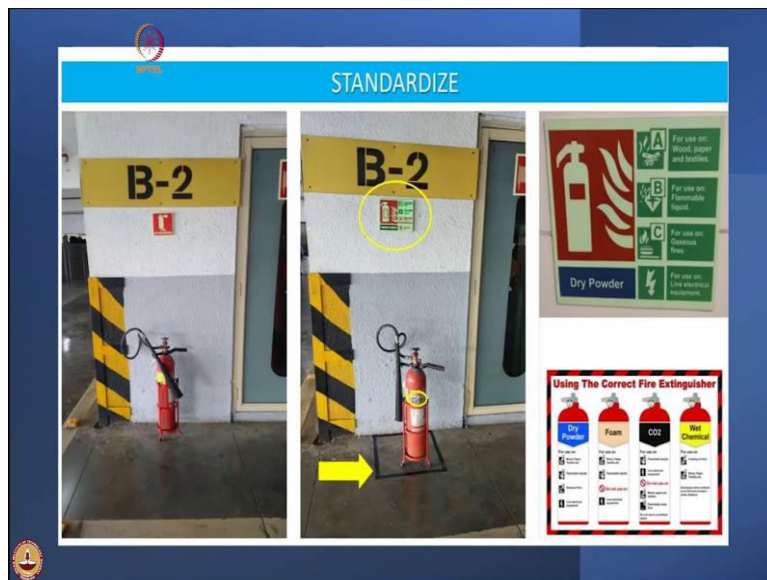
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STANDARDIZE – WASTE DISPOSAL MATRIX											
Waste Type	Dry Waste	Wet Waste	Horticulture Waste	COVID Waste	Cardboard Waste	Metal, Plastic & Wooden Waste	Waste (with commercial value) generated from specific projects	Electrical Waste	Used Oil & mixed Waste	Dead Birds and Animals	STP & Drain Waste
Attributes											
Waste generated from	Client Floors & Property Management Team	Client Floors & Property Management Team	Garden Team	Client Floors & Property Management Team	Property Management team & supporting vendors	Property Management team & supporting vendors	Supporting Vendors	Property Management team & supporting vendors	Property Management team & supporting vendors	Property Management team	Property Management team & supporting vendors
Collection Point	Client Floors, Parking, CBE & Godrej Offices	Client Floors, Parking, CBE & Godrej Offices	Terrace B Block utility area & C Block North East Corner of IT Park, Near OMC.	Client Floors, Parking, CBE & Godrej Offices	Parkings, Stores & Scrap Area	Scrap Area	Location of project execution	Scrap Area Behind Chiller Room	Pump Room, DG Room, STP Room	N.A.	STP & Shafts
Responsibility of waste disposal after authorization from Dept. & CBE	EES	EES	Horticulture Dept.	EES	Construction Store Dept.	Construction Store Dept.	Central Scrap Disposal Team	EMC	CBE	Property Management team	Property Management team & supporting vendors
Colour of Waste Bin	Blue	Green	Green	Yellow	Yellow	Metal, Dry Plastic, Stack, Wooden, Stone	Depending upon the type of waste	Red	Red	N.A.	N.A.
Storage Area	Block Garage Room	Block Garage Room	C Block North East Corner of IT Park, Near OMC.	Block Garage Room	Scrap Area Behind Chiller Room	Scrap Area Behind Chiller Room	Specific area designated for storage of project material	Scrap Area Behind Chiller Room	Scrap Area Behind Chiller Room	N.A.	Garden area on west side of building
Frequency of collection	Twice a day	Twice a day	As & when generated	Twice a day	As & when generated	As & when generated	As & when generated	As & when generated	As & when generated	As & when generated	Daily
Frequency of disposal	Daily	Daily	Daily or as & when required	Daily	Monthly or as & when required	Monthly or as & when required	Immediately or immediately or before the waste is about to overflow from the designated bins	Monthly or as & when required	Monthly or as & when required	As & when generated	Monthly or as & when required
Form to be filled	N.A.	N.A.	N.A.	Form 3	N.A.	N.A.	N.A.	Form 3	Form 3, Form 4 and Form 8	N.A.	N.A.
PPE	Mask, Gloves, Safety Shoes	Mask, Gloves, Safety Shoes	Mask, Gloves, Safety Shoes, Helmet	Mask, Gloves, Safety Shoes	Mask, Gloves, Safety Shoes	Mask, Gloves, Safety Shoes	Mask, Gloves, Safety Shoes, Helmet if required	Mask, Gloves, Safety Shoes, Helmet if required	Mask, Gloves, Safety Shoes, Helmet if required	Mask, Gloves, Safety Shoes, Helmet if required	Mask, Gloves, Safety Shoes

So, the next step is standardize. So, in standardize what we did is, you can see how we put the various yellow paint to the machine guards. We also created a waste disposal metrics where dry waste, wet waste, horticulture waste, COVID waste, cardboard waste, everything clearly it is mentioned from where it is generated and who is responsible for the disposal. So, we standardize this way.

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Also, you can see some more examples of standardization, how we created a key chest then notice board.

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And some more pictures like this. Even office, how we standardize the numbering to workstations, telephone, chair, pedestal for better recognition, tracking of assets.

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Also, how we did a file management with proper labelling.

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ILCE INSTITUTE FOR LEAN CONSTRUCTION EXCELLENCE NPTEL

Seiri SORT
Seiton SET IN ORDER
Seiso SHINE
Seiketsu STANDARDISE
Shitsuke SUSTAIN

To make it a habit of maintaining the momentum of the previous four S to ensure sustainability of the system & P-D-C-A Cycle. (Plan-Do-Check-Act)

Guidelines:

- Build awareness of the importance of 5S through retraining.
- Reward and recognise efforts of staff.
- Use techniques / approaches / strategies to sustain activities.

Part of daily work and it becomes a habit

ILCE CONSTRUCTION

So, once, I would like to say, that once this three S's in standardize, the previous three S's are done, this becomes a new normal slowly our old bad habits start going away. So, it helps us, in standardized step B, it helped us to maintain the progress and the behavioural changes. And it becomes a standard procedure.

Now, the last step that is sustain, the guidelines are here like we follow these guidelines to build awareness by training, retraining, also rewards and recognition have to be given at this stage, because this is the most important step, it is the most challenging and all the costs investments, which we are put in will be futile if this sustenance is not there. So, it is very, very important.

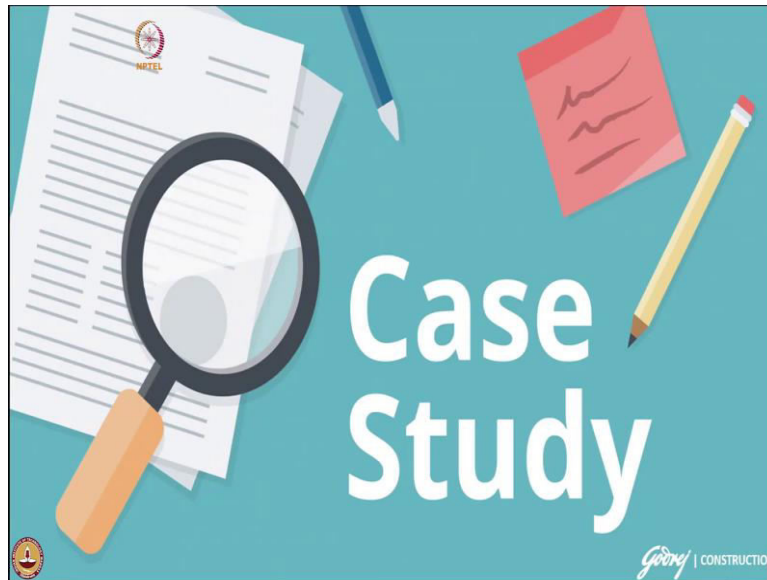
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SUSTENANCE

- Weekly 5S rounds & onsite progress meeting
- Audits & inspections - Monthly
- Review by Top Management (MMR & QBR)
- Inclusion of 5S in safety induction program
- Rewards & Recognitions through contest

So, how we did is by weekly 5S rounds, onset progress meeting, audits, inspections, even there were reviews by top management, inclusion of 5S in our safety induction programs to newcomers, rewards and recognitions were given through contests.

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5s Implementation at Godrej Khalapur Industrial Mega Project
 Mr. Ramesh Bhandarkar (rnb@godrej.com), Mr. Vijay Salunkhe (vbs@godrej.com),
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 GODREJ CONSTRUCTION

Abstract
 Lean construction study involves various tools which can be implemented on construction project sites. Among all tools, 5S is one of the simple, vital and powerful tool to work with for provision of safe and better quality environment at work place.

Introduction
 Lean 5S is easy to implement and have a systematic approach to cleaning, organizing and maintaining the work area as per principles and standards. Further it is very clear that premise with a clean and highly organized work area is a safe and efficient work area with little waste. More specifically the poster explains the implementation of 5S followed by audit observations and results against each of the 5 steps. Format for 5S audit is prepared to review each of the steps with rating system based on the site condition.

Need For Study
 The problem in time and energy loss during material findings which can be overcome by keeping everything systematically at proper places. The poster gives overall experience of 5S implementation on an ongoing construction site.

Objectives
 To have systematic approach to cleaning, organizing and maintaining the work area, improve Productivity, Safety, and waste reduction. Secondly to have a audit result with % rating given with color codes for each of the 5 steps so that we can have a clear idea about the specific steps which needs improvement as per 5S standard.

Methods
 The commencement was simple and started with training of 5S to all concern stakeholders directly working on jobsite. Timeline decided to work on respective areas for implementation of 5 steps of 5S (Sort, Set in Order, Shine, Standardize & sustain).

Team Formation: Based on allocated construction execution area one team was formed and area wise responsibility distributed team formation done.

Application: Application started with in house stores. Accordingly sort set in order, shine, standardize and sustain related 5S journey began. Subcontractors stores and site premises also covered under 5S implementation. One standard checklist prepared for audit purpose which is having % weightage for each of the 5.

Results
 5s was being done at Khalapur from the year 2016 and in line with various 5S training held by various stakeholders etc. at site has given tremendous advantage in maintain good housekeeping standards.

Post trainings monthly 5S audit is being done and the audit results are as follows,
 As per the audit report it is clear that the 5S system is streamlined up to sort & set in order.

Conclusions
 Based on overall audit results it is clear that the system is well implemented from improvement point of view. All the stakeholders including subcontractors needs to participate actively for the implementation and post that it has to be maintained till standardization as per the road map.
 Frequency of internal training and audit will help to standardize and sustain the process in 5S way. The work area has influenced to sort and set in order to a great extent. All the team is well aware of 5S steps but procedures shall be standardized.
 All the different types of material are well sorted and placed at main stores area considering safety precautions.
 Scrap, sorting and storage are the area for improvement.

References
 • O. Salem, J. Solomon, A. Ganesly, and M. Loring, "The Implementation and Assessment of Lean Construction Techniques", *Lean Construction Journal* 2005-Vol 2 #2 October 2005.
 • Akshayrao Hegde, Arjun P. Bilgimare "Advances in Construction: Lean Construction for Productivity enhancement and waste minimization" *International Journal of Engineering and Applied Sciences (IJEAES)*, ISSN: 2394-5661, Volume-2, Issue-11, November 2012.

Figures:
 Figure No. 1 5S Flow Chart: A flowchart showing the 5S process from 'Sort' to 'Sustain'.
 Figure 6 - 5s Audit Score: A bar chart showing audit scores for Sort, Set in Order, Shine, Standardize, and Sustain.
 Figure 7 - Radar Chart - 5s at Khalapur: A radar chart comparing 5S implementation across different areas.

Now, a short case study I will tell you about this is one of the 5S Implementation Program, which we had at our Godrej Khalapur Industrial Mega Project. So, it was presented at IGLC 2018, Chennai.

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Need For Study

The problem is time and energy loss during material findings which can be overcome by keeping everything systematically at proper places. The poster gives overall experience of 5S implementation on an ongoing construction site.

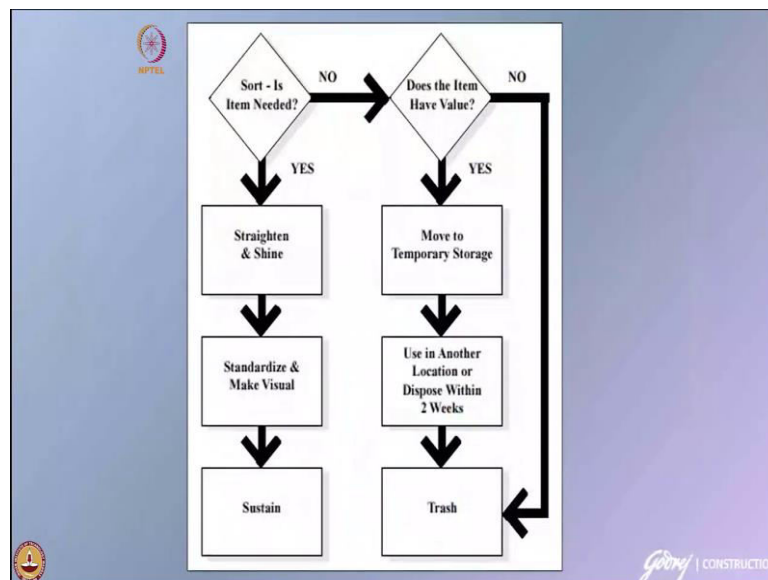
Objectives

To have systematic approach to cleaning, organising and maintaining the work area, improve Productivity, Safety, and waste reduction.

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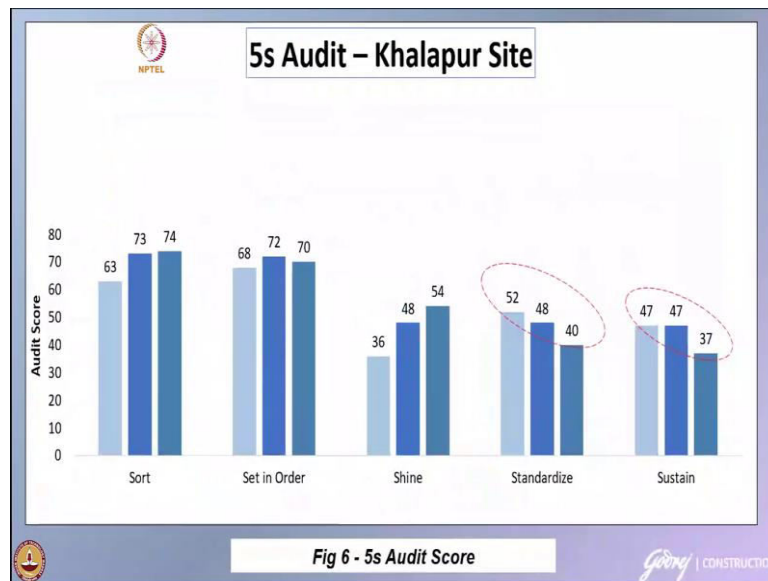
So, what were the objectives of this case study, there was to have a systematic approach to cleaning organizing and maintaining the work area to improve productivity safety, waste reduction, etcetera. Also audit results with a percentage rating with colour coding as I mentioned earlier.

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So, we used a flowchart like this. Basically, I will not go into details. So, this was how you have to go about for implementing the 5S's.

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This is what I spoken earlier, like sort, set in order. Now, these are the results of the three consecutive 5S audits, if you see in the first three S's, there is a good decent score, but if you see the last two, it is starts dropping after a point. So, they are the tough ones, the standardize and sustain. So, a lot of focus has to be maintained on these.

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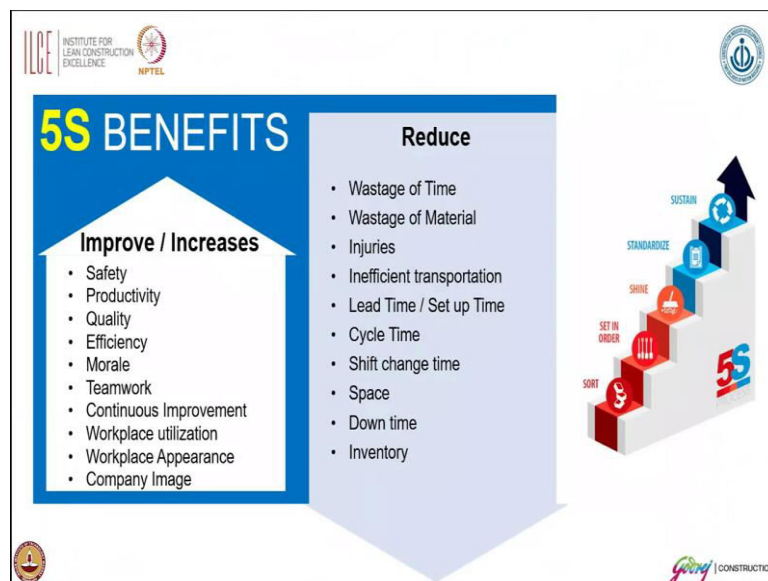
Some sample photographs, I will share with you some more. So, these are tough construction sites looking like this. Neat and clean after 5S.

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And also, we are in the business of ready-mix concrete manufacturing. So, even our RMC plants which are normally dirty, you can see they look very nice and clean.

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So, what overall let to conclude what for the 5S benefits we saw. So, normally when companies adopt 5S, they look for a safety and quality improvement, but we found at Godrej Construction, that not only safety quality, but productivity, efficiency, morale, all these other benefits were there. And what is the linkage to lean, all the eight wastes which are there, those also went away like the time spent in searching, wastage of material, injury, downtime, space, etcetera.

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Supplementary Module

Link (to read and contribute)
<https://tinyurl.com/yemou3g5>



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