



Lean and Environment Training Modules

Version 1.0 – January 2006



Lean and Environment Training Module 5

6S (5S+Safety)



Purpose of This Module

- » Learn why Environment, Health, and Safety (EHS) should be an integral part of 6S implementation
- » Learn how to identify EHS issues during the Sort process – the first pillar of 6S
- » Learn how to incorporate EHS into 6S inspections and audits of the Shine and Sustain pillars



What is 6S?

- » **6S** is modeled after the 5S process improvement system designed to reduce waste and optimize productivity in the workplace by:
 - Creating and maintaining organization and orderliness
 - Using visual cues to achieve more consistent operational results
 - Reducing defects and making accidents less likely

- » 6S uses the five pillars of 5S and an added pillar for Safety

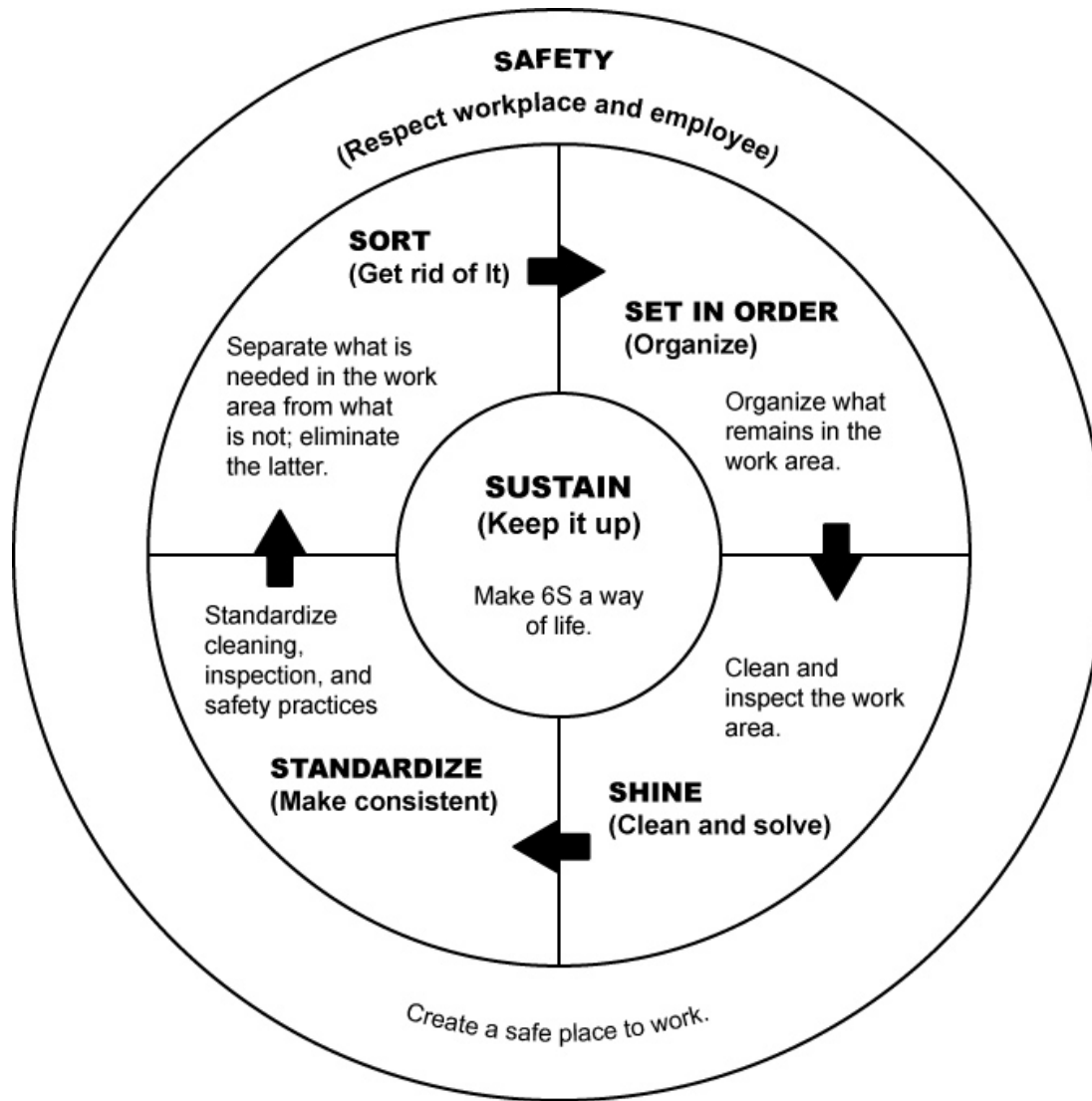


The Six Pillars of 6S

- 1. Sort (Get rid of it):** Separate what is needed in the work area from what is not; eliminate the latter
- 2. Set in order (Organize):** Organize what remains
- 3. Shine (Clean and Solve):** Clean and inspect
- 4. Safety (Respect workplace and employees):** Create a safe place to work
- 5. Standardize (Make consistent):** Standardize the cleaning, inspection, and safety practices
- 6. Sustain (Keep it up):** Make 6S a way of life



Relationship of the 6S Pillars





Why Should EHS be an Integral Part of 6S?

- » Expanding the scope of 6S to include EHS concerns can help your company to:
 - Reduce the chance paint, solvent, or other chemicals expire before they can be used
 - Make defects less likely, so less energy and materials are wasted
 - Avoid productivity losses from injuries and occupational health hazards by providing clean and accident-free work areas
 - Meet or exceed your company's environmental performance and waste reduction goals



TO CONSIDER

- » Name at least three ways your company could use 6S to improve its environmental performance and reduce wastes.
- » What metrics could you use to track EHS improvements from 6S activities?
- » What ideas do you have for improving your work area?





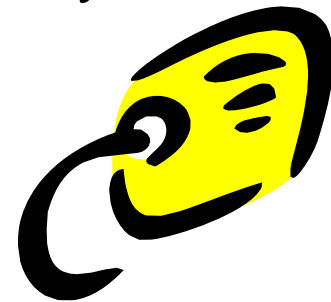
Tools for Incorporating EHS into 6S

- 1. Use yellow-tagging to identify EHS issues during the Sort process**
2. Expand 6S inspections of the Shine pillar to include EHS issues
3. Expand 6S audits performed as part of the Sustain pillar to include EHS issues
4. Identify additional ways to implement EHS within 6S



1. Use Yellow Tagging to Identify EHS Issues during the Sort Process

- » The objective of the Sort pillar is to identify items that are not needed in the work area and get rid of them
- » This is done through a process called red-tagging
- » A yellow-tag strategy can be used at the same time red-tagging takes place to identify any EHS issues





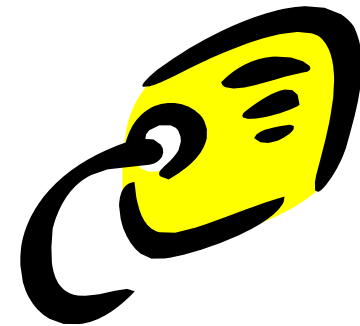
What is Yellow-Tagging?

- » **Yellow-tagging is a simple strategy used to:**
 - Identify environmental wastes and items that may be harmful to human health or the environment in the work area
 - Evaluate the need for these items
 - Evaluate potential alternatives for these items
 - Address them appropriately
- » This is a supplement to red-tagging-- key differences include the scope of projects, criteria used, and options for disposal or reuse



The Four Steps of Yellow-Tagging

1. Identify yellow-tag targets and criteria
2. Make and attach yellow tags
3. Evaluate and take care of yellow-tagged items
4. Document and share the results

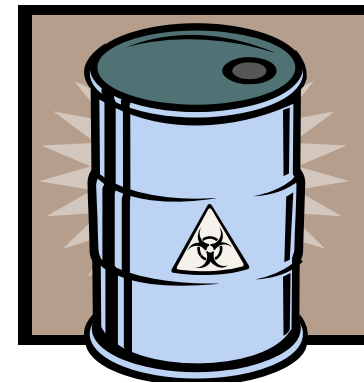




Step 1: Identify Yellow-Tag Targets...

- » Two types of targets should be identified:
 - The physical areas where tagging will take place
 - The specific types of items that will be evaluated

- » Potential items to consider yellow-tagging include:
 - EHS hazards in the workplace
 - Chemicals and other hazardous materials
 - Environmental wastes





...and Criteria

- » After choosing targets, criteria for evaluating yellow-tagged items needs to be agreed upon. This could include:
 - The risk of an item
 - The availability of alternatives
 - Opportunities for improved environmental performance



Step 2: Make and Attach Yellow Tags

- » Can be as simple as yellow sticky notes stating the reason for the yellow tag
- » Can contain standard data that your company uses for tracking materials
- » Key is to include data that will allow your company to evaluate performance improvements from 6S and support your company's overall materials tracking system



An Example of a Yellow Tag

Category (circle one)	1. Health or safety concern 2. Environmental concern		
Item Name and Number			
Description of Issue or Question			
Division Responsible:		Date:	



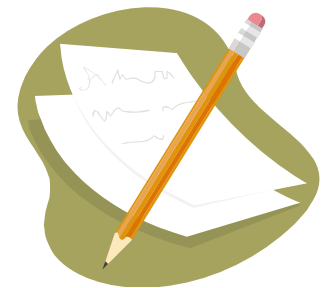
Step 3: Evaluate and Address Yellow-Tagged Items

- » If you find an EHS issue during yellow-tagging, ask “why” five times to identify the root cause of it
- » Then ask “how” to address the root cause
- » If an item is both unnecessary (red-tagged) *and* hazardous (yellow-tagged), follow appropriate procedures for disposal of hazardous wastes
- » If items are yellow tagged but not a red tagged (i.e. necessary but hazardous), find out if you can avoid using those materials or if there is a less toxic alternative



Step 4: Document and Share the Results

- » Document necessary information from the yellow-tagging process in a log book or other system
- » Track the improvements and savings that have resulted from yellow-tagging
- » Share your results with others to show what you have achieved and to generate ideas for future improvements





TO CONSIDER

- » Name three types of items and three locations that you could target for yellow-tagging at your company.
- » What criteria would you use for identifying EHS issues with yellow tags?
- » Name three improvements or savings that would result from a yellow-tagging activity at your company.





Tools for Incorporating EHS into 6S

1. Use yellow-tagging to identify EHS issues during the Sort process
- 2. Expand 6S inspections of the Shine pillar to include EHS issues**
3. Expand 6S audits performed as part of the Sustain pillar to include EHS issues
4. Identify additional ways to implement EHS within 6S



2. Expand 6S Inspections of the Shine Pillar to Include EHS Issues

- » Shine activities include daily cleaning and inspection by workers in their work area
- » Involve EHS personnel in developing specific inspection checklist items for each work area
- » Questions should integrate EHS management procedures and waste identification opportunities into daily inspections
- » Particularly useful for the [10 Common Manufacturing Processes with Environmental Opportunities](#)



Tools for Incorporating EHS into 6S

1. Use yellow-tagging to identify EHS issues during the Sort process
2. Expand 6S inspections of the Shine pillar to include EHS issues
- 3. Expand 6S audits performed as part of the Sustain pillar to include EHS issues**
4. Identify additional ways to implement EHS within 6S



3. Expand 6S Audits Performed as Part of the Sustain Pillar to Include EHS Issues

- » Sustain activities include weekly or other periodic audits to assess progress with 6S implementation
- » Involve EHS personnel in creating plant-wide inspection and audit questions and checklists
- » Questions should ensure that environmental wastes and risk are routinely identified, properly managed, and eliminated where possible
- » Questions can also be used to train 6S inspectors and auditors, or to provide background for a broader rating category



Example 6S Audit Checklist with EHS Items

Document Title: 6S AUDIT RECORD (SAFETY)	Document No.	Revision No.	Page: 1 of: 4
Required by:			

Audit Type: Initial Certification
 Sustaining

Auditors: _____ Date: _____
 Name: _____ Name: _____
 Name: _____
 Workplace Representatives: _____
 Name: _____ Name: _____

Subject	Questions	Yes	No
1. Aisles	A. Are aisles marked? 29 CFR 1910.22(b)(2)		
	B. Are aisle widths maintained? 29 CFR 1910.22(b)(1)		
	C. Are aisles in good condition? 29 CFR 1910.22(b)(1)		
	D. Are aisles and passageways properly illuminated?		
	E. Are aisles kept clean and free of obstruction? 29 CFR 1910.22(b)(1)		
	F. Are fire aisles, access stairways, and fire equipment kept clear? 29 CFR 1910.178(m)(14)		
	G. Is there a safe clearance for equipment through aisles and doorways? 29 CFR 1910.176(a)		

Click here for the full example checklist: <http://www.epa.gov/lean/toolkit/app-e.htm>



Tools for Incorporating EHS into 6S

1. Use yellow-tagging to identify EHS issues during the Sort process
2. Expand 6S inspections of the Shine pillar to include EHS issues
3. Expand 6S audits performed as part of the Sustain pillar to include EHS issues
4. **Identify additional ways to implement EHS within 6S**



4. Identify Additional Ways to Implement EHS within 6S

» There are many small things you can do to incorporate EHS in the 6S process. Here are just a few examples:

- Use low-toxic paint in white or a light color - this can help save lighting and energy costs
- Use different colored containers for hazardous waste, recycling, and other non-hazardous wastes
- Mark aerosol cans with colored dots to indicate where to dispose them
- Use environmentally friendly cleaning supplies





TO CONSIDER

- » How well do 6S inspections and audits assess EHS activities and performance in your company?
- » What approach might be most appropriate for incorporating EHS considerations into 6S assessment tools in your company?





Reflections on Integrating EHS and 6S

- » The 6S pillars work together to increase productivity, reduce defects, make accidents less likely, save time, and reduce costs
- » When expanded to include EHS issues, they can help reduce hazards and improve environmental performance
- » By explicitly incorporating EHS issues into all six pillars during 6S inspections, you can eliminate more waste and risk at your company creating a safer and more efficient workplace



Reflections on Integrating EHS and 6S, Continued

- » What did you learn from this training module that was particularly useful?
- » Do you need any more information to understand how to incorporate EHS into 6S?
- » Would any other tools be helpful?



EPA Lean and Environment Training Modules

- » For more information about EPA's Lean and Environment Training Modules, visit:
www.epa.gov/lean
- » EPA is interested in learning from organizations' experiences with lean and environment, and welcomes your comments on this training module
- » Please contact EPA by using the form found at
<http://www.epa.gov/lean/auxfiles/contact.htm>



More on 6S

- » Based upon the five pillars (5S) of the visual workplace in the Toyota Production System
- » “Cleans up” and organizes the workplace basically in its existing configuration
- » Typically the starting point for shop-floor transformation
- » Provides a methodology for organizing, cleaning, developing, and sustaining a productive work environment
- » Encourages workers to improve the physical setting of their work and teaches them to reduce waste, unplanned downtime, and in-process inventory



6S References

- » Hirano, Hiroyuki. *5 Pillars of the Visual Workplace*. Portland, OR: Productivity Press, 1995.
- » Peterson, Jim, Roland Smith, Ph.D. *The 5S Pocket Guide*. Portland, OR: Productivity Press, 1998.
- » Productivity Press Development Team. *5S for Operators: 5 Pillars of the Visual Workplace*. Portland, OR: Productivity Press, 1996.
- » Productivity Press Development Team. *5S for Safety Implementation Toolkit: Creating Safe Conditions Using the 5S System*. Portland, OR: Productivity Press, 2000.
- » Productivity Press Development Team. *5S for Safety: New Eyes for the Shop Floor*. Portland, OR: Productivity Press, 1999.



Pillar 1: Sort (Get rid of it)

- » Focuses on eliminating unnecessary items from the workplace that are not needed for current production operations
- » Uses visual methods such as red-tagging to identify these unneeded items
- » Involves evaluating the necessity of each item in a work area and dealing with it appropriately
- » Can help reclaim valuable floor space and eliminate broken tools, scrap, and excess raw material



Pillar 2: Set in Order (Organize)

- » Focuses on creating efficient and effective storage methods
- » Arranges items so that they are easy to use
- » Labels items so that they are easy to find and put away
- » Can only be implemented once the first pillar, Sort, has cleared the work area of unneeded items
- » Strategies include:
 - Affixing labels and placards to designate proper storage locations
 - Outlining work areas and locations
 - Installing modular shelving and cabinets



Pillar 3: Shine (Clean and solve)

- » Focuses on thoroughly cleaning the work area
- » Daily follow-up cleaning is necessary to sustain improvements
- » Enables workers to notice malfunctions in equipment such as leaks, vibrations, breakages, and misalignments that could lead to loss of production
- » It is a good idea to establish Shine targets, assignments, methods, and tools before beginning the Shine pillar



Pillar 4: Safety (Respect workplace and employee)

- » Focuses on eliminating hazards and creating a safe environment to work
- » Once the workplace has been organized and cleaned, potential dangers become easier to recognize
- » A separate “safety sweep” should be performed to identify, label, and deal with hazards
- » Safety measures can also be implemented in conjunction with strategies in the other five pillars



Pillar 5: Standardize (Make consistent)

- » Used to maintain the first three pillars
- » Focuses on creating a consistent approach with which tasks and procedures are performed
- » The first step is to assign 6S job responsibilities and integrate 6S duties into regular work duties using tools such as:
 - job cycle charts
 - visual cues (e.g., signs, placards, display scoreboards)
 - checklists
- » The next step is to prevent:
 - accumulation of unneeded items
 - procedures from breaking down
 - equipment and materials from getting dirty



Pillar 6: Sustain (Keep it up)

- » Makes a habit of properly maintaining correct procedures
- » Often the most difficult pillar to implement and achieve
- » Sustain focuses on defining a new status quo and standard of workplace organization
- » Without the Sustain pillar, the achievements of the other pillars will not last long
- » Tools for sustaining 6S include:
 - signs and posters
 - newsletters
 - pocket manuals
 - team and management check-ins
 - performance reviews
 - department tours



Ask “Why” Five Times¹

- » ***Why are we using so much water?***
The parts need to be cleaned before painting.
- » ***Why do the parts need to be cleaned?***
The parts fail quality checks if they aren't cleaned before being painted.
- » ***Why do the parts fail quality checks?***
The paint doesn't adhere when part surfaces are not prepared properly.
- » ***Why do the surfaces of the part need to be prepared?***
The surfaces get contaminated with oils used in the previous process.
- » ***Why are oils used in the previous process?***
The oils are used to prevent corrosion during storage.

¹Based on an example from Robert B. Pojasek, “Asking ‘Why’ Five Times,” *Environmental Quality Management* (Autumn 2000): 83.



10 Common Manufacturing Processes with Environmental Opportunities

1. Metal casting
2. Chemical and heat treatment of materials
3. Metal fabrication and machining
4. Cleaning and surface preparation
5. Bonding and sealing
6. Welding
7. Metal finishing and plating
8. Painting and coating
9. Waste management
10. Chemical and hazardous materials management



Key 6S Inspection and Audit Questions for Eliminating Environmental Waste and Risk

» **Sort (Get rid of it)**

- Are potentially risky items and environmental wastes yellow-tagged?
- Are all red-tagged items being disposed of properly, including those that must be managed as hazardous or universal wastes?



Key 6S Inspection and Audit Questions for Eliminating Environmental Waste and Risk

» **Set in Order (Organize)**

- Are material containers clean, stored off the floor, closed, properly stacked, and stored/staged in the proper areas?
- Are all containers with chemicals or wastes covered or sealed when not in use?
- Are all containers with materials, chemicals, and/or wastes properly labeled?
- Are initial accumulation points for hazardous waste clean and organized, and do they have effective visual controls?



Key 6S Inspection and Audit Questions for Eliminating Environmental Waste and Risk

» Shine (Clean and Solve)

- Are any leaks evident from equipment, piping, tanks, exhaust lines, or other areas in the workplace?
- Is air quality in the work area good, and free of dust, odors, and fumes? Are ventilation systems clean and unobstructed?
- Are all drains in good condition, free flowing, unobstructed and properly labeled?
- Are exterior locations near storm water drains and storm water retention areas free from garbage and debris?
- Are garbage and recyclables collected and sorted correctly? Are recycling containers and bins free from extraneous materials?



Key 6S Inspection and Audit Questions for Eliminating Environmental Waste and Risk

- » **Safety (Respect workplace and employee)**
 - Are employees using the proper protective equipment when handling chemicals and hazardous waste?
 - Are lockout and emergency procedures posted and easily accessible?



Key 6S Inspection and Audit Questions for Eliminating Environmental Waste and Risk

» **Standardize (Make consistent)**

- Are standard work procedures documented and available for the area?
- Are EHS management activities and procedures relevant to the work area integrated into standard work?



Key 6S Inspection and Audit Questions for Eliminating Environmental Waste and Risk

» Sustain (Keep it up)

- Are standard work procedures being followed?
- Are workers in the area aware of chemical hazards associated with standard work tasks?