

NURSING LEVEL-III

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UNIT-ONE

- DEVELOP UNDERSTANDING OF QUALITY SYSTEM

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

Develop understanding of quality system

- OHS requirements of 5s.
- purpose and elements of quality assurance (QA) system
- quality assurance procedures
- Meaning and concept of kaizen
- relationship of quality system and continuous improvement
- 5 s system
- Identifying waste (MUDA)

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Apply OHS requirements of 5s.
- Know purpose and elements of quality assurance (QA) system
- discuss quality assurance procedures
- Understand Meaning and concept of kaizen
- Understand relationship of quality system and continuous improvement
- Explain the 5 s system
- Identify waste (MUDA)

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. Perform “the Learning activity performance test”
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, ask your trainer for further instructions or go back to “Operation sheets”.

1. Occupational Health and Safety (OHS) Requirements of 5S

OHS requirements for kaizen 5S has no difference from the previous ones. OHS requirements are legislation/regulations/codes of practice and enterprise safety policies and procedures. This may include protective clothing and equipment, use of tooling and equipment, workplace environment and safety, handling of material, use of firefighting equipment, enterprise first aid, hazard control and hazardous materials and substances.

Personal protective equipment (PPE) include those prescribed under legislation/ regulations/codes of practice and workplace policies and practices. Safe operating procedures include the conduct of operational risk assessment and treatments associated with workplace organization. Emergency procedures include emergency shutdown and stopping of equipment, extinguishing fires, enterprise first aid requirements and site evacuation.

Occupational safety and health (OSH) also commonly referred to as occupational health and safety (OHS) or workplace health and safety (WHS) is an area concerned with the safety, health and welfare of people engaged in work or employment. Occupational health and safety is a discipline with a broad scope involving many specialized fields. It encompasses the social, mental and physical well-being of workers that is the “whole person”.

As per the definition adopted by the Joint ILO/WHO Committee on Occupational Health (1950), occupational health is the adaptation of work to man and of each man to his job. It has the following components.

- Promotion and maintenance of the highest degree of physical, mental and social wellbeing of workers in all occupations;
- Prevention among workers of departures from health caused by their working conditions;
- Protection of workers in their employment from risks resulting from factors adverse to health; and
- Placing and maintenance of a worker in an occupational environment adapted to his physiological and psychological equipment

Occupational health and safety is a cross- disciplinary area and it interacts with other disciplines such as occupational medicine, occupational or industrial hygiene, public health, safety engineering, ergonomics, toxicology, epidemiology, health physics, environmental health, industrial relations, public policy, industrial sociology, medical sociology, social law, labour law, and occupation health psychology. Although the urgency to address the

occupational (industrial) health and safety issues emerged during the Industrial Revolution, it becomes much more crucial to address the issue at present with the tremendous expansion of cities across the world, further resulting in wide spread industrialization and growth of population

Occupational safety and health can be important for moral, legal, and financial reasons. In common-law jurisdictions, employers have a common law duty (reflecting an underlying moral obligation) to take reasonable care for the safety of their employees. Statute law may build upon this to impose additional general duties, introduce specific duties and create government bodies with powers to regulate workplace safety issues: details of this will vary from jurisdiction to jurisdiction. Good OSH practices can also reduce employee injury and illness related costs, including medical care, sick leave and disability benefit costs.

2. History

The origins of occupational health and safety concerns can be traced back to the Industrial Revolution (late 18th to 19th century),



Picture1

Harry McShane, age 16, 1908. Pulled into machinery in a factory in Cincinnati and had his arm ripped off at the shoulder and his leg broken without any compensation.

The research and regulation of occupational safety and health are a relatively recent phenomenon. As labor movements arose in response to worker concerns in the wake of the industrial revolution, worker's health entered consideration as a labor-related issue.

Across the world, Acts, legislations, and policies were created with the objective of ensuring good health and safe work environments for all workers. Every country has its own act and policy on OHS.

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2. Principles of Occupational Health and Safety

Occupational health and safety is a multi-disciplinary field, covering issues related to law, medicine, technology, economics and industry specific concerns. The core occupational health and safety principles put forth by the ILO are as follows:

All workers have rights. Workers, as well as employees and government, must ensure that these rights are protected and foster decent conditions of labour.

Occupational health and safety policies must be established.

There is a need for consultation with the social partners (that is, employers and workers) and other stakeholders.

Prevention and protection must be the aim of occupational health and safety programs and policies.

Information is vital for the development and implementation of effective programs and policies.

Health promotion is a central element of occupational health practice.

Occupational health services covering all workers should be established.

Compensation, rehabilitation and curative services must be made available to workers who suffer occupational injuries, accidents and work related diseases.

Education and training are vital components of safe, healthy working environments.

Workers, employers and competent authorities have certain responsibilities, duties and obligations.

Policies must be enforced.

2. Workplace hazards

An occupational or work place hazard can be defined as any condition that may adversely affect the well-being or health of the exposed persons. Although work provides many economic and other benefits, a wide array of workplace hazards also present risks to the health and safety of people at work. These include "**chemicals, biological agents, physical factors, adverse ergonomic conditions, allergens, a complex network of safety risks,**" and a broad range of psychosocial risk factors.

Occupational hazards can be divided into two categories: **safety hazards that cause accidents that physically injure workers**, and **health hazards that result in the developing of a disease**. It is important to note that a “hazard” only represents the potential to cause harm.

Physical and mechanical hazards



Picture 2: At-risk workers without appropriate safety equipment

Physical hazards are a common source of injuries in many industries. They are perhaps unavoidable in certain industries, such as construction and mining, but over time people have developed safety methods and procedures to manage the risks of physical danger in the workplace. Employment of children may pose special problems. Falls are a common cause of occupational injuries and fatalities, especially in construction, extraction, transportation, healthcare, and building cleaning and maintenance.

A wood work workshop which includes welding of parts to make furniture and its components has to use the Personal Protective Equipment (PPE) at work. It is an employer’s/workers duty to provide ‘all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work which protects him against one or more risks to his health and safety’. In a fabrication and welding workshop an employer would be required to provide **face and eye protection, dust protection masks, hand gloves, safety footwear, overalls and other necessary PPE**.



Fig. 3: PPE for wood working

4.1. Hazards at work place can be related to the following but not limited:

Machines are commonplace in many industries and many machines involve moving parts, sharp edges, hot surfaces and other hazards with the potential to crush, burn, cut, shear, stab or otherwise strike or wound workers if used unsafely. Various safety measures exist to minimize these hazards, including lockout-tag out procedures for machine maintenance and roll over protection systems for vehicles.

According to the United States Bureau of Labor Statistics, machine-related injuries were responsible for 64,170 cases that required days away from work and over 600 work-related fatalities in 2008.

Confined spaces also present a work hazard. The National Institute of Occupational Safety and Health defines "confined space" as having limited openings for entry and exit and unfavorable natural ventilation, and which is not intended for continuous employee occupancy. Spaces of this kind can include storage tanks, ship compartments, sewers, and pipelines. Confined spaces can pose a hazard not just to workers, but also to people who try to rescue them.

Noise also presents a fairly common workplace hazard: occupational hearing loss is the most common work-related injury in the United States, with 22 million workers exposed to hazardous noise levels at work and an estimated \$242 million spent annually on worker's compensation for

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hearing loss disability. Noise is not the only source of occupational hearing loss; exposure to chemicals such as aromatic solvents and metals including lead, arsenic, and mercury can also cause hearing loss.

Temperature extremes can also pose a danger to workers. Heat stress can cause heat stroke, exhaustion, cramps, and rashes. Heat can also fog up safety glasses or cause sweaty palms or dizziness, all of which increase the risk of other injuries. Workers near hot surfaces or steam also are at risk for burns. Dehydration may also result from overexposure to heat. Cold stress also poses a danger to many workers. Over-exposure to cold conditions or extreme cold can lead to hypothermia, frostbite, trench foot, or chilblains.

Electricity:- poses a danger to many workers. Electrical injuries can be divided into four types: fatal electrocution, electric shock, burns, and falls caused by contact with electric energy.

Vibrating machinery, lighting, and air pressure (high or low) can also cause work-related illness and injury. Asphyxiation is another potential work hazard in certain situations. Musculoskeletal are avoided by the employment of good ergonomic design and the reduction of repeated strenuous movements or lifts. Ionizing (alpha, beta, gamma, X, neutron), and non-ionizing radiation (microwave, intense IR, RF, UV, laser at visible and non-visible wavelengths), can also be a potent hazard.

Self-check 1

Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. What is OHS represents for (1 point)
2. Define OHS? (1)
3. What are the goals of OHS? (2 points)
4. List some examples of OHS requirements in your work areas. (2points)
5. List at least five principles of OHS? (2)
6. List at least four workplace hazards? (2 points)

2.1. Quality system

A quality system is defined as the organizational structure, responsibilities, processes, procedures and resources for implementing quality management. Quality management includes those aspects of the overall management function that determine and implement the Company quality policy and quality objectives. Both quality control and quality assurance are parts of quality management.

What is Quality?

There is no single, universal definition of quality. Quality is a subjective term for which each person has his or her own definition. In technical usage, quality can have two meanings: (1) the characteristics of a product or service that bear on its ability to satisfy stated or implied needs and (2) a product or service free of deficiencies.

Let us see different definitions of quality

- Quality is the degree of excellence of something. (Dictionary)
- Quality is fitness for use. (Juran)
- Quality is conformance to requirements/ specifications. (Crosby)
- Quality should be aimed at the needs of the customer, present and future. (Dr Edward Deming)
- Quality is what the customer says it is. Quality is the degree of excellence at an acceptable price and control of variability at an acceptable cost (Armand V. Feigenbaum)

Different professionals give different interpretations to the term quality:

- For **users**, it is fitness for use.
- For **engineers**, it is conformance to specifications.
- For **marketing**, it is the degree of excellence at an acceptable price that will influence the market share.
- For **customer service**, a quality product is that with less customer complaint.

A comprehensive definition of quality –

- Product or service which fulfils an aggregate requirement of customers, in all aspects, at present and in the future and which customers can buy.

2.2. Quality Assurance

Quality assurance, quality planning and quality control are often used interchangeably to describe the same processes. However, as you get into the details of your plan, there are differences between them that you should know.

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- **Quality assurance** is the planned or systematic action necessary to provide enough confidence that a product or service will satisfy the given requirements of quality.
- **Quality control** is the ongoing effort to maintain the integrity of a process to maintain the reliability of achieving an outcome.

Quality assurance is process-oriented and focuses on defect prevention. It is generic and does not concern the specific requirements of the product being developed. It refers to the process used to create the deliverables, and can be performed by a manager, client, or even a third party reviewer. Quality assurance activities are determined before production work begins and these activities are performed while the product is being developed. The goal is to improve development and test processes so that defects do not arise when the product is being developed.

Examples of quality assurance include process checklists, project audits and methodology, and standards development.

2.2.1. Components of Quality Assurance

The components of a QA programs are often grouped into three levels, variously labelled:

- the strategic or organizational level (dealing with the quality policy, objectives and management and usually produced as the Quality Manual);
- the tactical or functional level (dealing with general practices such as training, facilities, operation of QA); and
- The operational level (dealing with the Standard Operating Procedures (SOPs) worksheets and other aspects of day to day operations).

2.2.2. The Benefits of Quality Assurance

Quality assurance offers a host of benefits to manufacturers who choose to make it a priority.

Three major benefits of good quality assurance are:

1. Cost Savings

Because QA is a proactive component of quality management, good QA leads to the prevention of quality issues.

2. Efficiency Boosts

With fewer defective products(furniture products), manufacturers are able to allot resources such as time, money, and warehouse space not only to creating more quality furniture but also to other projects.

3. Improvements In Customer Satisfaction

Customers receive better products on faster timelines and with greater levels of consistency when manufacturers employ effective quality assurance techniques.

Eg. Short delivery time, durable, esthetically attractive products, meeting customer specification, etc. increase customer satisfaction.

Self-check 2	Written test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. What is quality system? (2 point)
2. Define quality from different perspectives? (2 points)
3. What is quality assurance? (2)
4. Discuss the benefits of quality assurance? (4 points)

Information Sheet-3

Meaning and concept of kaizen

3.1. The Meaning of Kaizen

Mr. Masaaki Imai is one of the Japanese people who contributed to spreading of the term Kaizen throughout the world. Mr. Imai today serves as the president of a consulting company Cambridge Research Institute. In his book entitled “Kaizen: The Key to Japan’s Competitive Success” published In 1986, defined Kaizen as “a Japanese business philosophy that assumes our way of life – be it our working life, our social life, or our home life – should focus on continual improvement efforts”.

The Oxford English Dictionary also gives the following definition of Kaizen “a Japanese business philosophy of continuous improvement of working practices, personal efficiency, etc.”

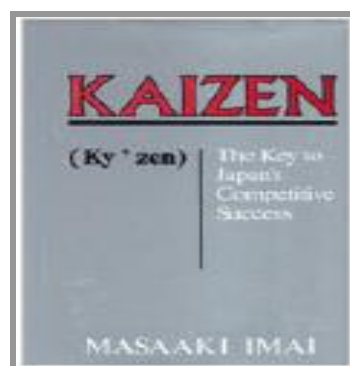


Fig.1: Cambridge Research Institute, President. Mr. Imai’s 1st book on Kaizen.

Kaizen is a Japanese philosophy for improvement that can be traced to the meaning of the Japanese words ‘Kai’ and ‘Zen’, which translate roughly into:

‘Kai’ - change, alter

‘zen’ - better, right

The above two words combine to mean “change for better” or “Continuous improvement.” Kaizen means improvement, continuous improvement involving everyone in the organization from top management, to managers then to supervisors, and to workers. It is a philosophy of never being satisfied with what was accomplished last week, last year or last time.

"Kaizen is a philosophy of continual, participatory and self-disciplined innovation management having its own integrated systems and problem solving tools, implemented with the highest level of commitments at all levels of owners, leaders and employees through enhancing their absorptive capability step by step aiming at creating new and advanced corporate culture to catch-up and attain world class competitiveness". Ethiopian Kaizen Institute.

3.2. The Three Pillars of Kaizen

Masaaki Imai proposed Kaizen as “the unifying thread running through the philosophy, the systems, and problem solving tools developed in Japan over the last 30 years”. The three pillars of Kaizen are:

- 1) As a philosophy
- 2) Kaizen systems
- 3) Kaizen tools

3.3. Kaizen as a Philosophy

Kaizen is a philosophy of continuous undertaking by an organization to improve its activities and processes with the goal to always improve Kaizen elements: Productivity, Quality, Cost, Delivery time, Moral, Safety, Environment and Gender equality (PQCDMSEG) so that the organisation can meet full customer satisfaction. Kaizen starts with the recognition that any corporation has problems and it solves these problems.

Kaizen as a philosophy is built-in and run through guiding principles. These guiding principles can be summarized as follows:

- Proactive and spontaneous participation of front-line workers (they are centre of Kaizen activities).
- Focus on the improvements of workplace/Gemba (the foundation of all the improvement efforts). It is a key entry to endless revolving activities of Kaizen.
- Practicing kaizen that lead to a corporate culture.
- Kaizen fosters process as well as result oriented thinking.
- Speak with data - collect, verify and analyse data.
- Put quality first even than cost and delivery.

- Bottom-up approach i.e. integrated total company approach: genuine participation of top management, middle managers and front-line employees in a collaborative working system throughout company organizations
- Continuous and endless activities in revolving cycles of PDCA resulting in significant improvements.
- Top management commitment.
- Learning process and customization
- Customer satisfaction

Kaizen as a management strategy has its characteristics. These are Kaizen has continuity, follows participatory approach, accumulation of small Improvement, applied using small investment and widely applicable.

Kaizen is a dynamic activity in revolving cycles of PDCA (Plan, Do, Check and Act). Once a new improvement becomes a new standard, the next cycle is set up to seek further improvement. Kaizen is a continuous challenge towards ever higher-level improvement, cycle by cycle, without an end.

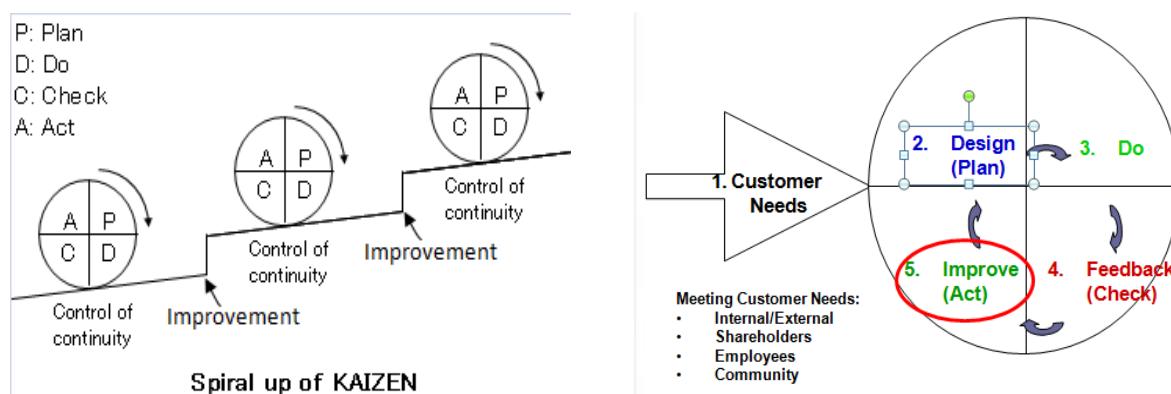


Fig. 2:- spiral up of kaizen

3.4. Kaizen Systems

Underlying the Kaizen strategy is the recognition that management must seek to satisfy the customer and serve customer needs if it is to stay in business and make a profit. This Kaizen strategy has systems that can be applied to realize planned goals and targets. These systems include:

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3.4.1. *Toyota Production System*

The Toyota Production system sometimes called the *Kanban* system or *Just in time*. *Just-in-time* means that the exact number of required units is brought to each successive stage of production at appropriate time. *Kanban* is a signboard or label used as a communication tools in this system. It is attached to each box of parts as they go to the assembly line. *Jidoka* (autonomation) is when machines stop automatically whenever a problem occurs. All machines at Toyota are equipped with automatic stop mechanisms.

The Toyota production system is, in a nutshell, a system which makes sure that the required number of parts and components are manufactured and forwarded to the final assembly line so that final assembly does not stop. It is a system that is still undergoing change and improvement every day.

3.4.2. *Total Productive Maintenance*

Total productive maintenance (TPM) is an innovative Japanese concept which can be traced back to 1951. TPM aims at maximizing equipment effectiveness throughout the entire life of the equipment. TPM can be considered as the medical science of machines.

The goal of TPM is the total elimination of all losses. Overall Equipment Effectiveness (OEE) allows to quantify the 6 major types of equipment losses. These are:

- 1) *Breakdowns* are times when equipment breaks down due to failure and isn't available when we need it to be.
- 2) *Setup and adjustment losses* occur when we're working to prepare equipment to run a different type of product. (e.g. exchange of dies in injection molding machines, etc.)
- 3) *Idling and minor stoppages* (abnormal operation of sensor, etc.).
- 4) *Reduced speed* (discrepancies between designed and actual speed of equipment)
- 5) *Defects in process and rework* (scrap and quality defects requiring repair). These occur when our machines produce defective products.
- 6) *Reduced yield* between machine startup and stable production.

3.4.3. *Total Quality Control (TQC)*

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Organized kaizen activities involving everyone in a company- managers and workers- in a totally integrated effort towards improving performance at every level. This improved performance is directed toward satisfying such cross-functional goals as quality, cost, scheduling, manpower development, and new product development. It is assumed that these activities ultimately lead to increased customer satisfaction. It is equivalent to Company-Wide Quality Control (CWQC).

3.4.4. Total Quality Management System

A number of management practices, philosophies and methods to improve the way an organization does business, makes its products, and interacts with its employees and customers. QCC activity functions as an integral part of TQM. TQM was evolved from TQC in the late 80s.

3.5. Kaizen Tools

As presented by Masaaki Imai ,Kaizen is an umbrella concept that embraces different continuous improvement activities on an organization as shown in the *figure below* . There are a large number of related and often overlapping implementation methods and technical tools that belong to the kaizen Toolkit. Basing on kaizen philosophy and through following kaizen systems, Kaizen tools bring continuous improvement.

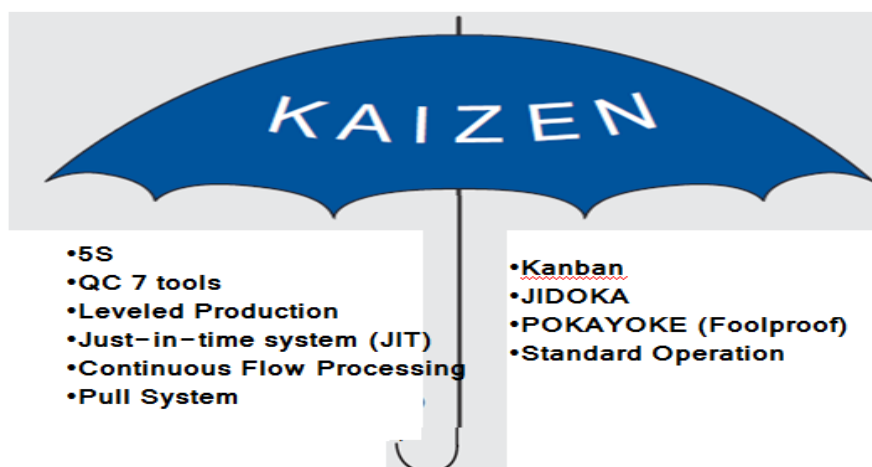


Fig.3: Some basic Kaizen techniques.

Self-Check 3	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

-
1. Define the word Kaizen? (3 points)
 2. Write the origin of Kaizen and its emergence and dissemination in Ethiopia? (3 points)
 3. Write the three pillars of Kaizen? (3 points)
 4. Discuss the characteristics of Kaizen? (5 points)
 5. What are the principles and benefits of Kaizen? (4 points)
 6. What does waste / Muda mean? (2 points)

Information Sheet 4- Understand the relationship of quality system and continuous improvement in the workplace

4.1. Quality system and quality management system

A quality system is defined as the organizational structure, responsibilities, processes, procedures and resources for implementing quality management. Some use quality system and quality management system interchangeably.

- Quality management system is a collection of business processes and functions aimed at continuous improvement of quality to ensure customer expectations and requirements are met or exceeded. It is the act of overseeing all activities and tasks that must be accomplished to maintain a desired level of excellence. This includes the determination of a quality policy, creating and implementing quality planning and assurance, and quality control and quality improvement.

While the emphasis of a QMS is not placed on profits, proper implementation can and often does increase a company's bottom line. In fact, as evidences show many companies have successfully used quality management systems to skyrocket their earnings, quite often through the hidden and unconsidered benefits that may not immediately be seen when looking at the framework of a QMS.

- Continuous improvement is the act of continually looking to improve upon a process, product, or service through small incremental steps.
- Implementing a Continuous Improvement Process in the furniture making organizations should be standard practice. Without improvements in way of doing, making furniture, finishing and over all wood furniture making process it is difficult to stay competitive and profitable in the market. So, not satisfying by what you did and searching ways of improvement is the key to success.

4.2. Continuous Improvement Process Phases

There are four phases associated with the continuous improvement process. These phases are associated with the Shewhart Cycle:

- Phase 1 "Plan": Plan for change and identify improvement opportunities.
- Phase 2 "Do": Implement changes identified.
- Phase 3 "Study" (Check): Check to determine if the change had the desired outcome.

- Phase 4 “Act”: If successful, implement across the organization and process.



Fig.1 : Shewhart Cycle

As shown in the above figure the process is non ending as you act on a problem you get solutions, you start to plan for other area the needs to be improved.

- Kaizen is also a system of continuous improvement in quality, technology, processes, company culture, productivity, safety and leadership. Kaizen, mostly, focuses on implementation. Kaizen is a system that involves every employee from the upper management to the cleaning crew. Everyone in an organization is encouraged to come up with small improvement suggestions on a regular basis. This is not a random activity undertaken once a month or once a year. It is continuous. This will be discussed in detail in the coming topics.

But the continuous improvement tools and techniques is not only the PDCA cycle. There are other tools and techniques:

- Kanban**, to help you visualize, manage, and optimize your workflows.
- A3s**, to provide vision and structure to big-picture improvements.
- The PCDA Cycle**, to systematically test hypotheses.
- Gemba walks**, to keep leaders and front-line workers on the same page.
- The 5 Whys**, to encourage inquisitive thinking and effective problem-solving.
- Value Stream Mapping**, to help organizations focus on structuring processes around customer needs.

The role of continual improvement is one of the most important principles in any quality management strategy, and enables a core goal for all improvement practices within the organization.

The ISO (International Organization for Standardization) has the following to say about continuous improvement: “continual improvement should be a permanent objective of the organization.” There are many major benefits that can be seen through continual improvement, including a performance advantage that comes from improved organizational proficiencies, the alignment of improvement strategies at all levels with strategic goals and the flexibility to react promptly to opportunities that may arise.

4.3. Quality Assurance A Continuous Improvement System

The Quality Assurance (QA) Process mirrors the Continuous Improvement Process (CIP) which is an ongoing effort to improve products, services, or processes. It's is a six-step systematic approach to plan, sequence and implement improvement efforts using data and elaborates on the Shewhart Cycle (Plan, Do, Study Act). The CIP provides a common language and methodology which enables understanding the improvement process.

- Quality Assurance within an organization is an important factor that helps generate satisfied customers, of its employees, and provides tools for integral management. In an ever-demanding market, it is necessary to comply with quality standards in order to be competitive.
- The Quality Assurance departments lead by quality assurance manager are increasingly committed to continuous improvement, customer satisfaction, as well as standardization and control of processes. Maintaining and meeting the quality requirements of our customers are a constant need to ensure the quality of our furniture that will go to the final consumer.
- Quality control and continuous improvement may seem like two independent concepts, but must go hand in hand in order to have a maximum control over services and processes.
- The Quality Assurance Department is like a living entity, continuously revising to detect as soon as possible the deficiencies and risks in order to act quickly and implement improvements. The continuous review of procedures, follow-up of corrective actions and training of all the personnel involved keeps us alive throughout the furniture manufacturing process of our factory.

By its very nature, QA assumes that if serious failures are inspected and eliminated, what remains is somehow excellent. This embraces a philosophy that accepts quality as what is “good enough,” rather than what is “the best possible.”⁴ Equally important, QA is judgmental and often perceived as punitive, eliciting fear, resentment, and denial from practitioners.

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So to achieve quality in all aspects of the furniture making, the need to follow continuous improvement or the PDCA cycle is very important. The quality system and continuous improvement goes hand in hand.

4.4. Quality assurance procedures and guide line elements

Quality systems involve internal and external aspects.

An internal quality system covers activities aimed at providing confidence to the management of an organization that the intended quality is being achieved. This is called a “**quality management system.**” Successful implementation of quality management systems can contribute to an increase in product quality, improvements in workmanship and efficiency, a decrease in wastage, and increased profit.

An external quality system covers activities aimed at inspiring confidence in the client that the supplier’s quality system will provide a product or service that will satisfy the client’s quality requirements. This is called a “**quality assurance system.**” The quality System can work effectively only when the top executive responsible for engineering or production takes full responsibility for interpretation and implementation of the quality assurance program.

Quality system consists three main phases



Tools and techniques of quality assurance:

1-Plan quality & perform quality control tools and techniques:

Tools and techniques used to plan quality and quality control will be applied to quality assurance. Some of them are

- √ cause and effect diagrams, control charts, flowcharting, histogram, pareto chart, runn chart, scatter diagram, statistical sampling, inspection, approved change requests review

2-Quality Audits:

A structured independent review to determine whether project activities comply with organization and project policies

- ✓ Identify good/best practices
- ✓ Identify gaps/shortcomings
- ✓ Offer assistance, raise productivity
- ✓ Highlights contributions of each audit

3-Process analysis:

- ✓ Identify needed improvements
- ✓ Examines problems experienced, constraints and non-value added activities during process

Outputs of quality assurance:

1-Organizational process assets updates:

- ✓ Elements organizational process assets that may be updated but are not limited to quality standards.

2-Change requests: taking actions to increase effectiveness or efficiency of the policies.

3-Project Management plan updates:

- ✓ Quality management plan
- ✓ Schedule management plan
- ✓ Cost management plan

4-Project management updates:

- ✓ Quality audit reports
- ✓ Training plans
- ✓ Process documentation

Elements of a QA guideline

- **QA system:** Company-wide QA system/program including responsibility of each organization, document control, and Warranty return program
- **Materials qualification:** List of materials used in module fabrication; qualification program, process, criteria (properties tracked), and records for each of these materials

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- **Process control:** Statistical process control and/or other process control system including: Calibration of sensors, change control, and log of data collected to support traceability
- **In-line testing:** List of measurements completed, frequency of these measurements, log of data collected
- **Traceability:** Documentation from ingot to module shipment; maintenance of records to trace future failures, ID marking of modules
- **Retest schedule:** Frequency of qualification or other module-level testing, log of data
- **Warranty return program:** Documentation of number of returns, identified failures, and corrective actions
- **Factory inspection procedure:** Frequency of inspection, fraction of manufacturing lines inspected, and evaluation criteria
- **Audit:** Internal/external audit program including factory audit procedures and retest of qualified product.

Self-Check 4	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is quality management? (3 points)
2. Write the four phases associated to continuous improvement? (4 points)
3. Write at least four tools and techniques of continuous improvement?(4 points)
4. List down at least five elements of Quality assurance guide lines? (5 points)
5. What is PDCA cycle? Explain it? (4 points)

You can ask you teacher for the copy of the correct answers.

Information Sheet 5

5S System

5.1. 5S basics

Definition of 5S

5S is a systematized approach to standardize work environment of an organization so as to create a workplace that is more organized, more efficient, safer, cleaner, and more pleasant to work in, and to maintain it on an on-going basis. The pillars of 5S are all Japanese words beginning with the letter S. Since their adoption within Western implementations of lean, various anglicized versions of the terms have been adopted by different writers and educators.

5S consists of:

- (1) Seiri = Sort;
- (2) Seiton = Set in Order;
- (3) Seiso = Shine;
- (4) Seiketsu = Standardize;
- (5) Shitsuke = Sustain.

5.1. The five pillars of 5S

Sort: is the 1st of the five components of 5S. Sort means sorting out necessary and unnecessary items in the furniture making workplace, dispose of the unnecessary and keep only those items necessary for the current operations of the workplace.



Set in order: is the 2nd of the five components of 5S. Set-in-order means deciding the place for necessary items, arrange them to keep easy access, and display signs so that they can be found immediately and returned or replenished properly.



Shine: is the 3rd of the five components of 5S. It means cleaning equipment, facilities and floor space in the workplace, and ensure that they are in good operating condition.

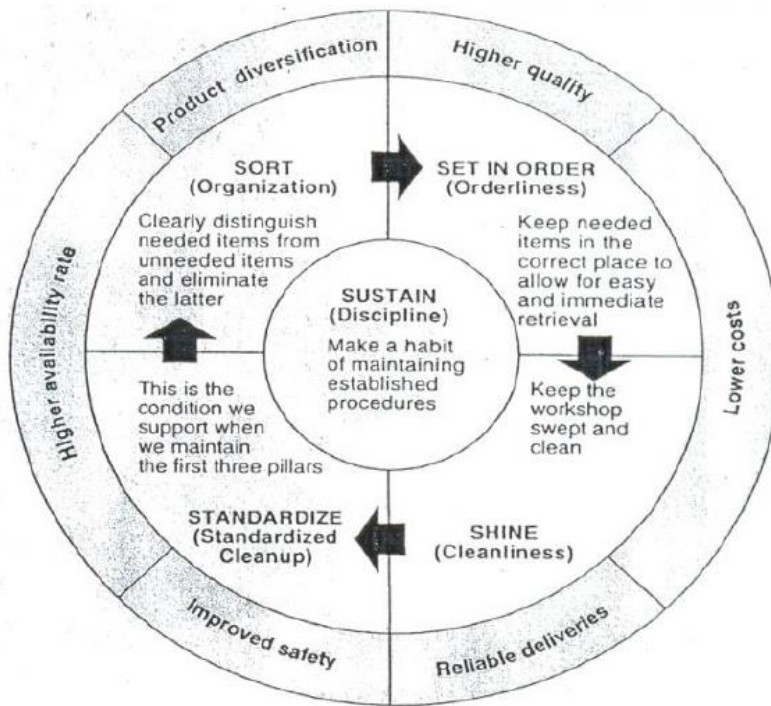


Standardize: is the 4th pillar of 5S. Standardize means maintain organized and clean workplaces by making Sort, Set in Order, and Shine activities integrated into everyone's regular work.

Sustain: is the 5th of the five components of 5S. Sustain means making a self-disciplined habit of maintaining procedures, rules and arrangements of the organisation.

Summary of 5S

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5.2. Benefits of 5S

The 5S system sounds so simple that people often dismiss its importance. However the fact remains that 5S:

- Makes your workplace safer, cleaner and more pleasant place to work.
- Makes your job more satisfying.
- Eliminates overburdens and disappointments.
- Makes it easier to communicate with everyone you work with.
- Gives you an opportunity to give creative input how your work place should be.
- Decreases and makes defects zero that brings higher quality
- Eliminates waste that reduces cost
- Avoids delays and bring reliable delivery
- Increases safety by decreasing accidents
- Increases productivity by decreasing breakdown
- Reduces complaint and brings greater confidence and trust.



Before

After

5.3. Stages of 5S implementation

The three stages of implementing 5S are:

- Planning
- Implementation
- Sustaining

5.3.1. Planning

Steps for planning include:

1. Form Kaizen Team organizational structure
2. Recognize current condition
3. Deciding activity range
4. Goal setting
5. Planning stage
6. Budgeting
7. Kick-off

- **Overall promotion plan**

The following sample formats can be used to prepare a plan for 5S implementation.

Sample 1

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Date of issue:
 Issued by 5S Committee

Overall Plan for 5S Promotion																												
Period	1st month				2nd month				3rd month				4th month				5th month				6th month				Progress (%)			
Item	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	25	50	75	##
Basic plan	Preparation								Sort								Set-in-Order								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
													Sustain				Standardise				Shine				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
																									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
																									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
																									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preparing necessary tools	♦				♦								♦				♦								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The tools common to the activities can be prepared in advance.																												
Preparing textbook for 5S education	♦				♦								♦				♦								<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The tools common to the activities can be prepared in advance.																												
Providing 5S introductory education	♦																								<input type="checkbox"/>			
Provide comprehensive 5S education.																												
Providing 5S education	♦				♦								♦				♦											
Provide 5S education prior to the start of each 5S activity.																												
Photo-shooting	♦				♦								♦				♦				♦							
	Take photographs before and after each activity.																											
	Achievement reviews will be conducted in the later term of each 5S activity to choose the best 5S activity results.																											

Sample 2

5S Promotion Block Plan by Machining Group																												
					1 month				2 months				3 months				4 months				5 months				6 months			
					1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w	1w	2w	3w	4w
Basic plan					Preparation				Seiri								Seiton				Seiketsu				Seiso			
No.	Block	5S	Group	Plan																								
1	M-1	Seiri	A	Plan																								
		Result																										
		Seiton		Plan																								
		Result																										
2	M-2	Seiri	B	Plan																								
		Result																										
		Seiton		Plan																								
		Result																										
3	M-3	Seiri	C	Plan																								
		Result																										
		Seiton		Plan																								
		Result																										
4	M-4	Seiri	D	Plan																								
		Result																										
		Seiton		Plan																								
		Result																										

Self-Check 5	Written Test
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Instructions: Answer all the questions listed below. Write your answers in the sheet provided in the next page.

1. What are the 5S? (5 points)
2. What are the benefits of 5S? (5 points)
3. What are the first three stages of 5S implementation? (3 points)
4. What are the steps for 5S planning? (7 points)
5. Name two methods to recognize or collect data about the current condition of a work place. (2 points)

Information Sheet 6- Identifying waste (MUDA)

Wastes/‘Muda’

Wastes or Muda are activities which use resources, time or cost without adding value. Value-added means those activities that change raw material into value for the customer. Muda is a Japanese word meaning wasteful activity. It is anything unnecessary in operation. It increases production cost and affects the quality of the product and also delivery time. Reducing or eliminating Muda is, of course, one of the fundamental objectives of any quality-oriented person.

- **Muda identified by TOYOTA company**

Seven main types of wastes were identified by Taichi Ohno as a part of the Toyota Production System. However, this list has been modified and expanded by various practitioners. Every waste you will come across in any organization or even in day-to-day life will fall into one of these seven categories. Such as: **Muda of overproduction, inventory, motion, transportation, waiting, over-processing and defecting making.**

Over production: Muda of over-production means to produce things more than necessary in terms of type, time, and volume. It is called “the worst kind of Muda” since it hides all the other wastes.

Inventory: Muda of inventory includes a stock of raw materials, work in process and final products. It needs stock space and excess transportation.

Motion: Muda of Motion are non-value adding movements or more than necessary movements of workers, equipment, and machines, such as looking for goods, bending, stretching, walking, lifting, and reaching etc.

Transportation: Muda of transportation is transportation of materials over a long distance or re-piling up. This Muda is usually difficult to be totally eliminated but reducing is possible.

Waiting: Muda of waiting is when workers, machines or parts wait for an upstream process to deliver, for a machine to finish processing, and for parts or materials to come.

Over-processing: This Muda consists of unnecessary processing and operations. It is processing beyond the standard required by the customer. Eg. relying on inspections rather than designing the process to eliminate problems.

Defect making: This Muda of defect making includes defects, inspections for defects in-process, reworks, and resource loss.

Self-Check 6	Written Test
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Instructions: Answer all the questions listed below. Write your answers in the sheet provided in the next page.

1. What is MUDA? (5 points)
2. List the seven wastes/ Muda? (5 points)

UNIT-TWO

SORT NEEDED ITEMS FROM UNNEEDED

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Identifying all **items** in the work area
- Distinguishing between essential and non-essential items
- Sorting items to achieve deliverables and value expected by downstream and final customers
- Sorting items required for regulatory or other required purposes
- Placing any non-essential item in an appropriate place other than the workplace

Regularly check that only essential items are in the work area.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Identify all **items** in the work area
- Distinguish between essential and non-essential items
- Sort items to achieve deliverables and value expected by downstream and final customers
- Sort items required for regulatory or other required purposes
- Place any non-essential item in a appropriate place other than the workplace
- Regularly check that only essential items are in the work area

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. Perform “the Learning activity performance test” which is placed following,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to

“Operation sheets”.

Information Sheet 1- Identifying and distinguishing essential and non-essential item

1. Explanation - Sort

1.1 Definition of Sort

Sort, the first pillar of 5S, means classifying items in the workplace in to two categories – necessary and unnecessary - and removing all the unnecessary items that are not needed for current operations. It corresponds to the just in time (JIT) principle of “only what is needed, only in the amount needed, and only when it is needed.” The workplace is full of unused machines, jigs, dies, rejects, work-in-process, raw materials, supplies, parts, shelves, containers, desks, workbenches, files, carts, racks, pallets and other items.

People tend to hang onto parts, thinking that they may be needed for the next time. They see an inappropriate machine or equipment and think that they will use it somehow. In this way, inventory and equipment tend to accumulate and get in the way of everyday activities. This leads to a massive build of waste in companywide or in the whole workshop. An easy rule is to remove anything that will not be used within the next 30 days. A ceiling on the number of necessary items should be established. The detail sorting activities of essential and nonessential items will be discussed in the next section.

1.2. Benefits of sort activity

Implementing this first pillar creates a work environment in which space, time, money, energy, and other resources can be managed and used most effectively. Sorting can lead to a much safer workplace. By clearing out the items you no longer need, people will have more room to work and things like trip hazards and items falling off shelves will be greatly reduced. Sorting also improves work flow since there is less clutter to deal with and will most definitely increase productivity in both production and office environments. Problems and annoyances in the work flow are reduced, communication between workers is improved, and product quality is increased, and productivity is enhanced.

If the first pillar is not well implemented, the following types of problems occur:

1. The factory or a workshop becomes increasingly crowded and hard to work in.

- Unnecessary lockers, shelves, cabinets and items make communication between employees difficult.
- Time is wasted in searching for parts and tools.
- Increase unnecessary maintenance cost of unneeded inventory and machinery.
- Excess stock-on-hand hides other types of problems in production.
- Unneeded items and equipment's make it harder to improve the process flow.

1.3. Implementing sort activity

It is not always easy to identify unneeded items in a factory or workshop. Workers seldom know how to separate items needed for current production from unnecessary items. The following procedures will help in implementing sort activity.

1.3.1. Plan and procedures for sort activity

Sort activity plan sheet (sample)

Area : M-1

Preparation date: Year Month Day
Prepared by 5S Committee

Basic Plan		Sort Activity																																											
		1st month															2nd month																												
Activity		18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Determining activity area	Plan																																												
	Result																																												
Preparing documentations	Plan																																												
	Result																																												
Deciding where to put unnecessary things	Plan																																												
	Result																																												
Holding a briefing session	Plan																																												
	Result																																												
Red tagging	Plan																																												
	Result																																												
Filling out documentations	Plan																																												
	Result																																												
Quantification	Plan																																												
	Result																																												
General cleaning	Plan																																												
	Result																																												

1.3.2. Record and quantify all items in the work area

The following sample formats can be used to record all necessary and unnecessary items.

- A sample format for recording all items at the workplace.

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List of All the Items at the Workplace

[illegible][illegible]

- A sample format for recording necessary items at the workplace.

Preparation date: Year Month Day

List of Stock at the Workplace

Prepared by 5S Committee

[illegible]

Category

A: Product, half-completed product, part or material
B: Facility, jig, tool or consumable material
C: Documentation (form, record, etc.)

Quantity

Present: Present quantity
Regular: Necessary quantity
Red tag: Surplus

Frequency of use

a: Everyday
b: A few times a week
c: A few times a month
d: A few times a year

Common use

A:Used by every worker
B:Used only by specific workers

A sample format for recording unnecessary items in the workplace

Prepared by 5S Committee

[illegible]

A: Product, half-completed product, part or material	1. Unlisted and unused for a long period 2. Overproduced in-process stock beyond the capacity of the inter-process storage 3. Defect (processing/assembly/machining failure, or parts defect) 4. Others
B: Facility, jig, tool or consumable material	1. Unusable 2. Surplus 3. Others
C: Documentation (form, record, etc.)	1. Obsolete and unusable 2. Duplicate 3. Others

Self-Check 1	Written Test
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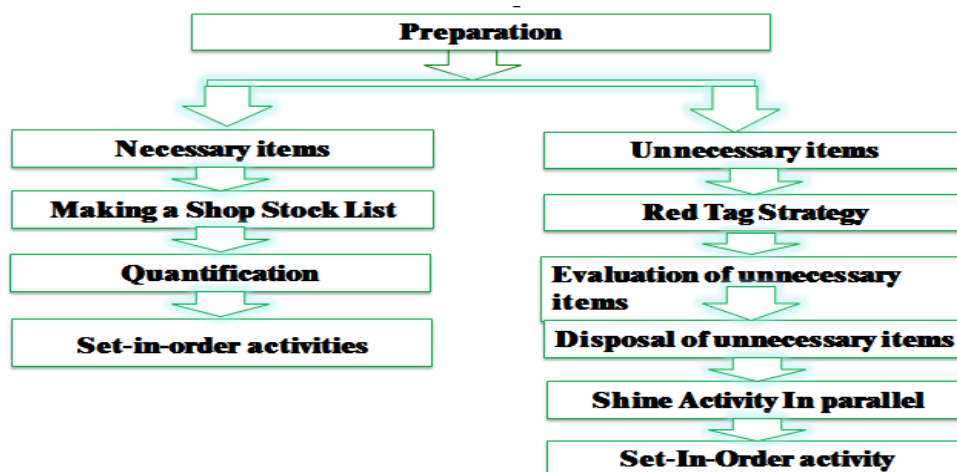
Instructions: Answer all the questions listed below. Write your answers in the sheet provided in the next page.

1. Define the first pillar of 5S – Sort. (2 points)
2. List the benefits of implementing sort activity? (4 points)
3. What kind of problems will occur if sorting is not properly implemented? (4 points)

2. Method of sorting items

Red-tag holding area can also help to evaluate the need of an item instead of simply getting rid of it. This greatly reduces the risk of disposing of an item that is needed later that will be explained in detail in the next contents.

2.1. Procedure for Sort activity



Step 1- Evaluate and take pictures of the work area. It's extremely important to take pictures during this evaluation step since referencing them after improvements have been made can be very enlightening. To help you get started use also a 5S evaluation form.

Step 2 - Identify and red tag the items you no longer need.

Step 3 - Decide what to do with the tagged items.

2.2. Red tag strategy for unnecessary items

2.2.1. Overview of red tagging

The Red-Tag Strategy is a simple method for identifying potentially unneeded items in the factory or workshop, evaluating their usefulness and dealing with them appropriately. Red-tagging means putting red tags on items in the factory or workshop that need to be evaluated as being necessary or unnecessary. A Red tag is a red colored tag used to identify items no longer needed in a particular work area. The red tags catch people's attention because red is a colour that stands out. An item with a red tag is asking three questions:

- Is this item needed?
- If it is needed, is it needed in this quantity?
- If it is needed, does it need to be located here?

Once these items are identified, they can be held in a “Red Tag Holding Area” for a period of time to see whether they are needed, disposed of, relocated, or left exactly where they are.

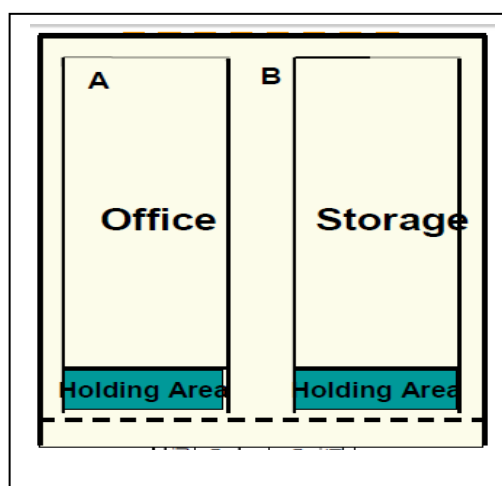
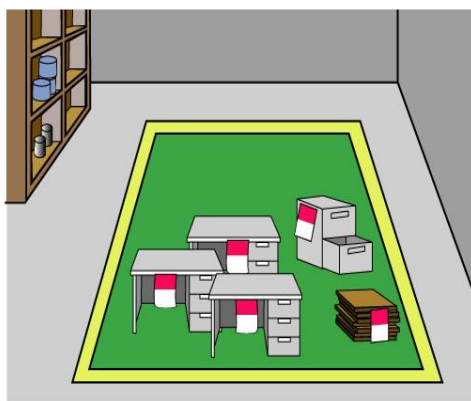
2.2.2. Red-tag Holding areas

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In order to implement the red-tag strategy effectively, a red-tag holding area must be created. A red-tag holding area is an area set aside for use in storing red-tagged items that need further evaluation. Red-tagging is helpful when the need or frequency of need for that item is unknown. When an item is set aside in a red-tag holding area and watched for an agreed-upon period of time people tend to be more ready to let it go when that time is over.

There are two red-tag holding areas: local and central holding areas. Local red-tag holding area is used to manage the flow of red-tagged items with in a local department or production area. Central red-tag holding area is used to manage the flow of items that cannot or should not be disposed of by individual departments or production area. Usually central red-tag holding area is used by an organization that is launching a companywide red-tagging effort.

Red-tag Holding Area



2.2.3. Steps/procedures in Red tagging

The red-tagging process in a department or work area can be broken down into seven steps.

- Step 1: Launch the red-tag project.
- Step 2: Identify the red-tag targets.
- Step 3: Set red-tag criteria.
- Step 4: Make red tags.
- Step 5: Attach red tags.
- Step 6: Evaluate red-tagged items.
- Step 7: Document the results of red-tagging.

Various types of information on a red tag may include:

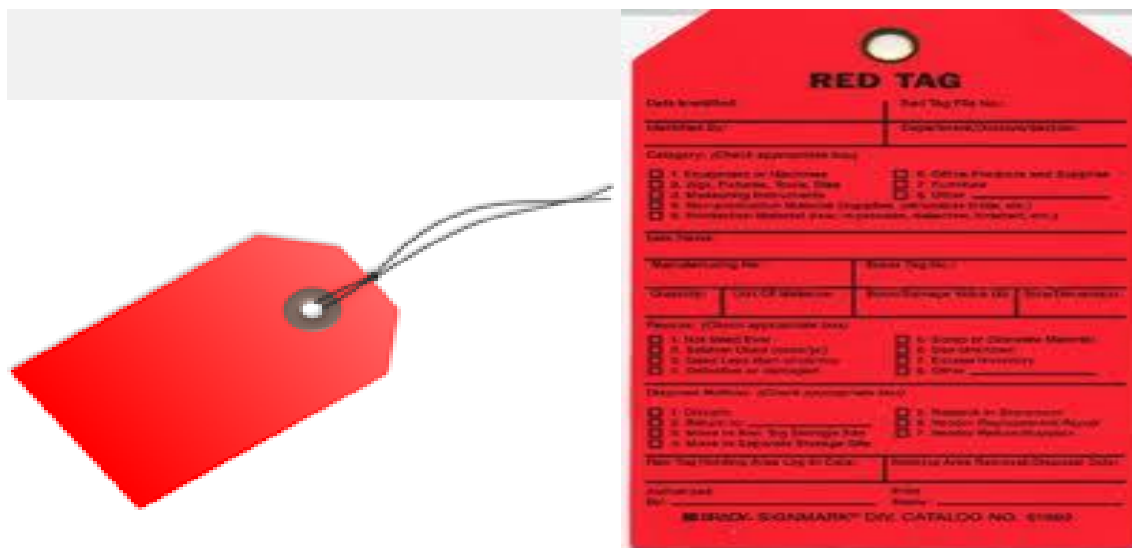
- Category: provides a general idea of the type of item (e.g., a warehouse item or machine). Categories include raw materials, in-process inventory, products, equipment, jigs, tools and dies.
- Item name and manufacturing number.
- Quantity: indicates the number of items included under this red tag.

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- Reason: describes why a red tag has been attached to this item.
- Division: includes the name of the division responsible for managing the red-tagged item.
- Value: includes the value of the red-tagged item.
- Date: includes the red-tagging date.

RED TAG			
Category	1. Raw material 5. Machine and other equipment 2. In-process stock 6. Dies and jigs ③ Semi-finished goods 7. Tools and supplies 4. Products 8. Other		
Item name:	Door		
Manufacturing No.:	PX-180X		
Quantity:	2 Units	Value:	\$ (total)

Red Tag		No.
Name of applicant:	Date	
Name of item:	Quantity:	
Part No.:		
Location:		
Classification <input type="checkbox"/> 1. Material <input type="checkbox"/> 2. Part <input type="checkbox"/> 3. Inventory in-process <input type="checkbox"/> 4. Product <input type="checkbox"/> 5. Equipment/facilities <input type="checkbox"/> 6. Cutting tool <input type="checkbox"/> 7. Jig <input type="checkbox"/> 8. Fixing <input type="checkbox"/> 9. Others		
A: Reason for item of 1 to 4 <input type="checkbox"/> a. Miscalculation/mistakes in sales/production plan <input type="checkbox"/> b. Order cancellation <input type="checkbox"/> c. Design/specification change <input type="checkbox"/> d. Design error <input type="checkbox"/> e. Order error <input type="checkbox"/> f. Receipt error (Insufficient inspection) <input type="checkbox"/> g. Machining error <input type="checkbox"/> h. Assembly error <input type="checkbox"/> i. Obsolescence, Long time storage <input type="checkbox"/> j. Others		
B: Reason for item of 5 to 9 <input type="checkbox"/> k. Ageing <input type="checkbox"/> l. Out of order <input type="checkbox"/> m. No longer applicable <input type="checkbox"/> n. Others		



The material used for red tags can be red paper, thick red tape, or others. Red tags can be laminated with plastic or another material to protect them during repeated use.

Evaluation format for red-tag items (sample)

Evaluation Form of Red Tag Items							Date of issue: Issued by: 5S promotion office		
Stage: Seiri		Unused Period (month)	Red tag strategy				Unnecessary item list		Remarks
Object	Type		Required	Not required	First	Second	Required	Not required	
Material	Main	12	<input type="radio"/>		Leader	Manager	<input type="radio"/>		
	Supplement	6	<input type="radio"/>		Leader	Manager	<input type="radio"/>		
	Broken	1		<input type="radio"/>				Dispose	
Parts	Common Use	6	<input type="radio"/>		Leader	Manager	<input type="radio"/>		
	Exclusive use	3	<input type="radio"/>		Leader	Manager	<input type="radio"/>		
Inventory in-process		2	<input type="radio"/>		Leader	Manager	<input type="radio"/>		
Product		3	<input type="radio"/>		Manager	General manager	<input type="radio"/>		
Facility		6	<input type="radio"/>		Manager	General manager	<input type="radio"/>		
Die		6	<input type="radio"/>		Manager	General manager	<input type="radio"/>		
Jig		6	<input type="radio"/>		Leader	General manager	<input type="radio"/>		
Cutting tool		6	<input type="radio"/>		Leader	Manager	<input type="radio"/>		
Tool		3	<input type="radio"/>		Leader	Head of Section	<input type="radio"/>		
Measuring instrument		6	<input type="radio"/>		Leader	Head of Section	<input type="radio"/>		
Carrying equipment		2	<input type="radio"/>		Leader	Head of Section	<input type="radio"/>		

How to evaluate:
Evaluate items based on unused period of them.

How to prepare the form

- 5S committee set the standard by main unneeded item
- Explain contents of this form to each promotion block.
- Compile the form to help Seiri activity such as requirement of red tag and record on unnecessary item list.

Self-Check 2	Written Test
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Instructions: Answer all the questions listed below. Write your answers in the sheet provided in the next page.

1. What is red-tagging strategy? (3 points)
2. List the steps of red-tagging strategy. (4 points)
3. Write some disposal methods of unnecessary items? (4 points)
4. What is the information written in red tag? (4 points)

4.1. Types of unnecessary items

Some of types of unnecessary items are:

- defective or excess quantities of small parts and inventory
- outdated or broken jigs and dies
- worn-out bits
- outdated or broken tools, equipment or machines
- old rags and other cleaning supplies
- electrical equipment with broken cords
- outdated posters, signs, notices, and memos



Unused machinery or equipment



obsolete equipment

4.2. Places where unnecessary items accumulate

Some locations where unneeded items tend to accumulate are:

- in rooms or areas not designated for any particular purpose
- in corners next to entrances or exists
- Along interior and exterior walls, next to partitions, and behind pillars.
- Under the eaves of warehouses.
- under desks and shelves and in desk and cabinet drawers
- near the bottom of tall stacks of items
- on unused management and production schedule boards
- in tools boxes that are not clearly sorted

The next table shows disposal methods.

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Treatment	Description
Throw it away	Dispose of as scrap or incinerate items that are useless or unneeded for any purpose.
Sell	Sell off to other companies items that are useless or unneeded for any purpose.
Return	Return items to the supply company.
Lend out	Lend items to other sections of the company that can use them on a temporary basis.
Distribute	Distribute items to another part of the company on a permanent basis.
Central red-tag area	Send items to the central red-tag holding area for redistribution, storage, or disposal.

Ideally, unnecessary equipment should be removed from areas where daily production activities take place. However, large equipment and equipment or machine attached to the floor may be expensive to move. It is sometimes better to leave this equipment where it is unless it interferes with daily production activities or prevents workshop improvements. Label this unneeded and difficult to move equipment with a “freeze” red tag, which indicates that its use has been “frozen,” but that it will remain in place for the time being.

Self-Check 3	Written Test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. What are the reasons for the accumulation of unnecessary items in a workshop? (3 points)
2. Name places where unnecessary items are accumulated? (2 points)
3. Write the disposal method of items in the work area?5

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Prepared by 5S Committee

[illegible]

A: Product, half-completed product, part or material	1. Unlisted and unused for a long period 2. Overproduced in-process stock beyond the capacity of the inter-process storage 3. Defect (processing/assembly/machining failure, or parts defect) 4. Others
B: Facility, jig, tool or consumable material	1. Unusable 2. Surplus 3. Others
C: Documentation (form, record, etc.)	1. Obsolete and unusable 2. Duplicate 3. Others

Quantitative Results

No	Improvement Indicators	Before Kaizen	Target	After Kaizen	Improvement (%)	Remark
1	Free floor space					
2	Searching time for tools, materials, etc					
3	Transaction made/income generated					
4	Labor saving					
5	Parts saving					
6	Tools& Equipment found					
7	Raw Material saving					
8	Transportation/travel					
9	Inventory					

10	Lead time					
11	Machine down time					
12	Frequency of Machine failure					
13	Production volume per day					
14	Labour productivity					
15	Delivery Time					
16	Defect rate					
17	Number of Customer complaints					
18	Minimized Cost of Production					

Qualitative Results

Record intangible/qualitative results and changes that are achieved by applying Sort activity using the following indicators.

No	Improvement Indicators	Description of the Result
1	Knowledge of the 1 st S - Sort	
2	Team work	
3	Morale of workers	
4	Communications between workers by removing unnecessary materials	
5	Corporate culture of kaizen	
6	Fatigue or stress	
7	Relationship with customers	
8	Awareness of safety	
9	Orderliness of work place	
10	Other	

LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

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Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks.

Task 1: Using the given template, prepare a plan for sort activity in your workshop.

Task 2: Using the given templates, list necessary and unnecessary items.

Task 3: Make red-tags appropriate for your workshop.

Task 4: Following the procedures of sort activity, perform sort activity in the assigned workshop.

UNIT-THREE

SET ALL ITEMS IN ORDER

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Identifying location and placing each essential item
- Regular checking of item in its location

Regularly check that only essential items are in the work area.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Identify location and placing each essential item
- check items regularly for their location

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. Perform “the Learning activity performance test” which is placed following,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet-1

Identifying location and placing each essential item

1. Explanation of the second pillar of 5S – Set in order

1.1 Definition of set in order

Set in order means arranging necessary items so that they are easy to use and labelling them so that anyone can find them and put them away. The key word in this definition is “anyone”. Set in order can be implemented only when the first pillar- sort is done first. No matter how well you arrange items, set in order can have little impact if many of the items are unnecessary and not sorted. Similarly, if sorting is implemented without setting in order, it is much less effective. Where necessary items should be placed should be made clear for anyone to immediately find them and return them easily. Hence, Sort and Set in order work best, when they are implemented together.



Example of Set in order



Set in order of tool

1.2 Benefits of set in order

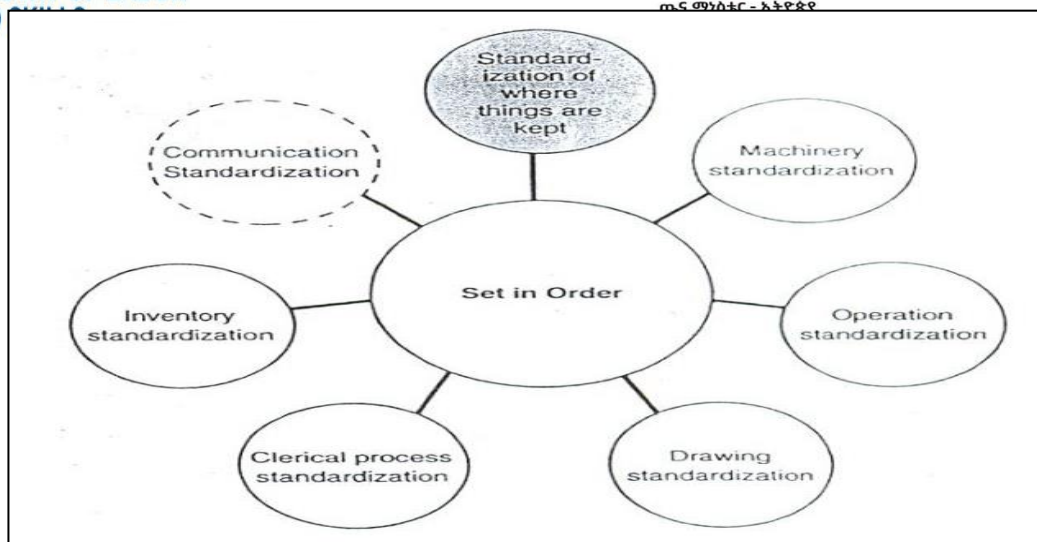
Setting in order is important because it eliminates many kinds of waste from operations in a workplace. These include searching time waste, waste due to difficulty in using items, and waste due to difficulty in returning items. In general, the following problems and wastes are avoided when set in order is well implemented.

1. Motion wastes
2. Searching time wastes
3. The waste of human energy
4. The waste of excess inventory
5. The waste of defective products
6. The waste of unsafe conditions

The set in order step is actually at the core of so many important business principles such as safety, ergonomics, quality, inventory control, productivity, standard work, the visual workplace and employee morale. Also it is the core of standardization.

Set in order is the core of standardization.

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In implementing set in order pillar, we use visual controls so that communications became easy and smooth. For example, we can visually know where items are placed and where to return them and so on. A visual control is any communication device used in the workplace that tells us at a glance how work should be done. Through visual controls, information such as where items belong, how many items should be placed there, what the standard procedure is for doing something, the status of work in process etc can be communicated.

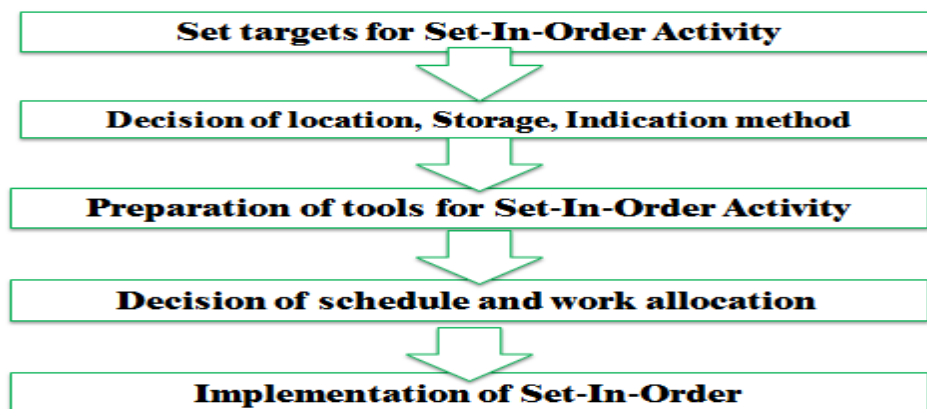
2. Implementing the Second Pillar of 5S – Set in order

2.1 Plan and procedures for set in order

Set in order activity plan sheet (sample)

[illegible]

Procedures for Set in order



There are some principles for deciding best locations for tools and equipment's, Jigs, tools and dies. Different from materials, equipments, machinery and parts in that they must be put back after each use. Some of the principles are:

- Locate items in the workplace according to their frequency of use. Place frequently used items near the place of use. Store infrequently used items away from the place of use.
- Store items together if they are used together, and store them in sequence in which they are used.

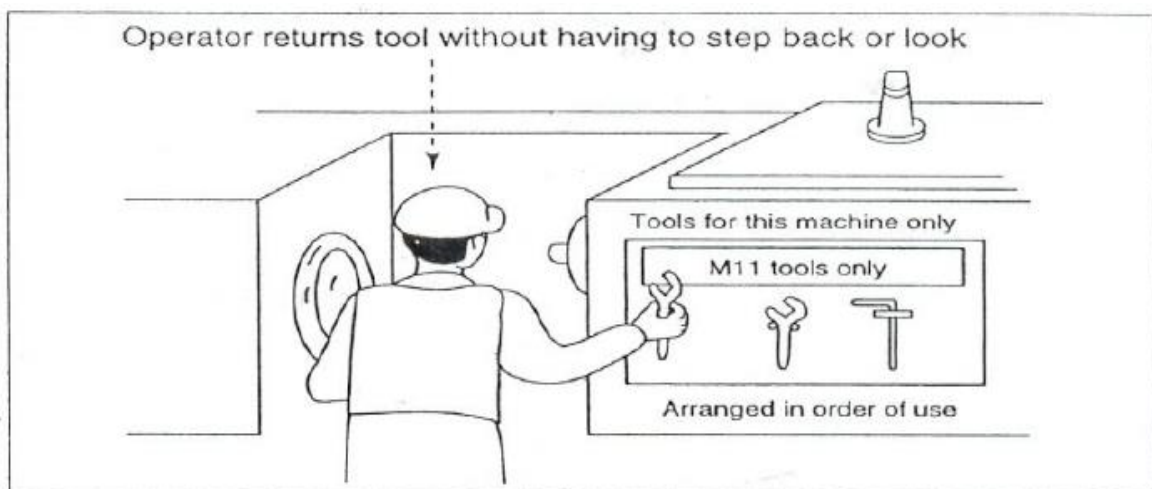


Fig. Tools kept at hand and stored in the order used.

- Device a “just let go” arrangement for tools. This approach involves suspending tools from a retractable cord just within reach so that they will automatically go back in to their correct storage position when released.
- Make storage places larger than the items stored there so that they are physically easy to remove and put back.
- Eliminate the variety of jigs, tools and dies needed by creating a few jigs, tools and dies that serve multiple functions.
- Store tools according to function or product. Function-based storage means storing tools together when they have similar functions. This works best for job-shop production. Product-based storage means storing tools together when they are used on the same product. This works best for repetitive production.

The principles that are helpful to eliminate or reduce motions that operators make are:

Principle 1: Start and end each motion with both hands moving at once.

Principle 2: Both arms should move symmetrically and in opposite directions.

Principle 3: Keep trunk motions to a minimum.

Principle 4: Use gravity instead of muscle.

Principle 5: Avoid zigzagging motions and sudden changes in direction.

Principle 6: Move with a steady rhythm.

Principle 7: Maintain a comfortable posture with comfortable motions.

Principle 8: Use the feet to operate on and off switches for machines where practical.

Principle 9: Keep materials and tools close and in front.

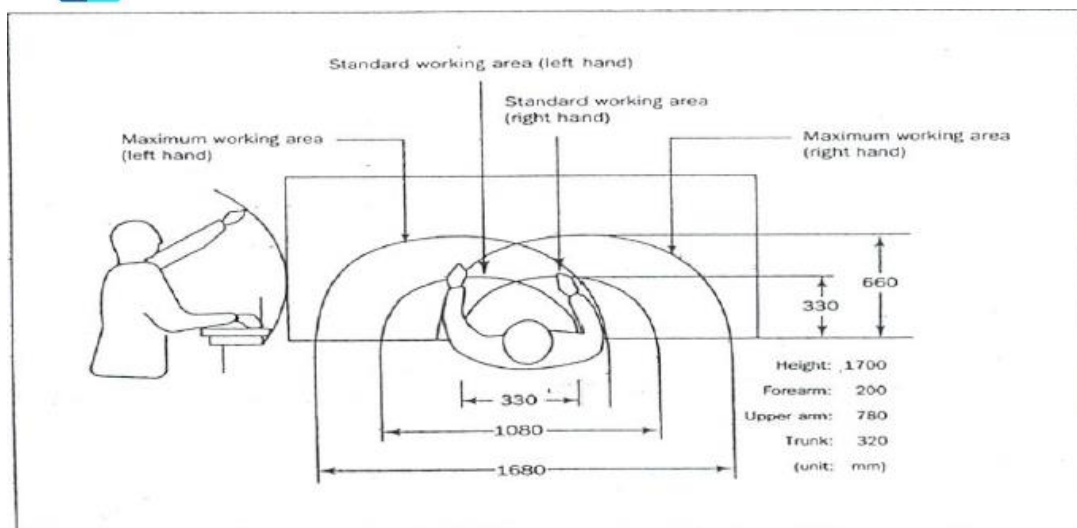


Fig. Guidelines for locating parts, equipments, and machinery to maximize motion efficiency.

Principle 10: Arrange materials and tools in the order of their use.

Principle 11: Use inexpensive methods for feeding in and sending out materials.

Principle 12: Stand at a proper height for the work to be done.

Principle 13: Make materials and parts easy to pick up.

Principle 14: Make handles and grips in efficient, easy-to-use shapes and positions.

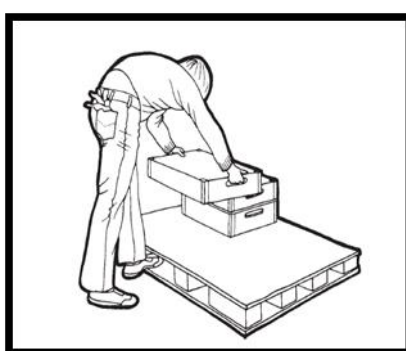


Fig. Motion wastes

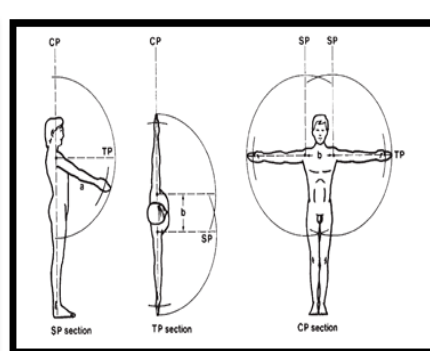


Fig. No waste of motion

2.2 Set in order strategies

Once best locations have been decided, it is necessary to mark these locations so that everyone knows what goes where, and how many of each item belongs in each location. There are several strategies for marking or showing what, where and how many.

Motion Economy strategy: - we can remove motion waste from existing operation. By using human body appropriately, by organizing the workplace and by redesigning of tools and equipment, we can minimize motion waste.

Visual control Strategy: - A visual control is any communication device used in the work environment that tells us at a glance how work should be done. There are several strategies for setting in order items so that to easily identify what, where and how many (visual control). These visual control strategies are

Signboard strategy: uses signboards to identify what, where, and how many. The three main types of signboards are:

- Location indicators that show where items go.
- Item indicators that show what specific items go in those places.
- Amount indicators that show how many of these items belong there.

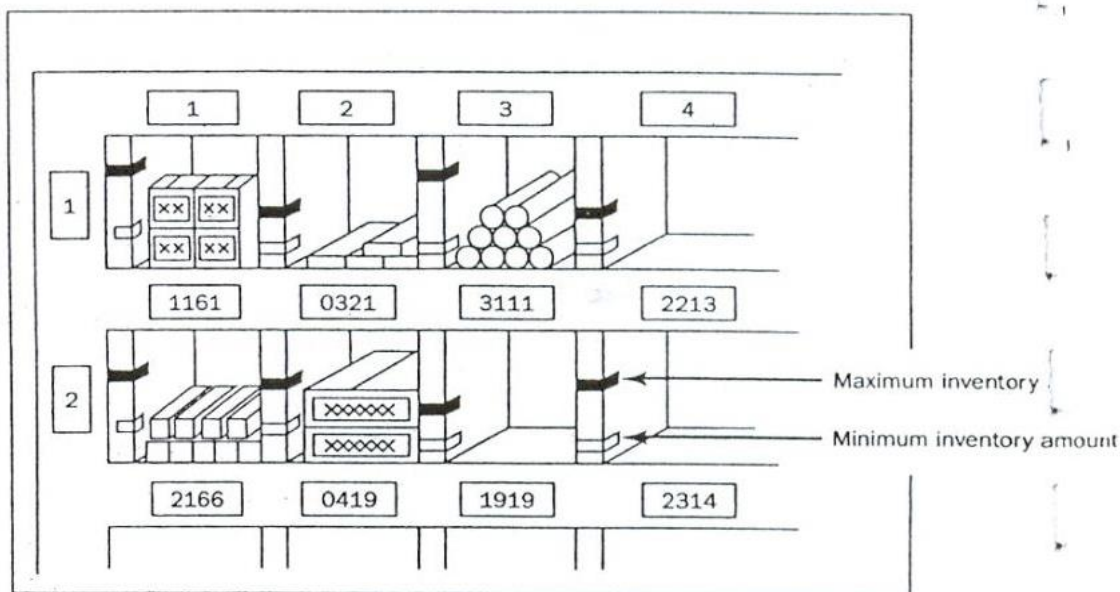


Fig. Amount indicators

Painting strategy: is a method for identifying locations on floors and walkways. It is called the Painting strategy because paint is the material generally used. But also plastic tape, cut in to any length, can be used. Plastic tape, although more expensive, shows up just as clearly as paint and can be removed if the layout is changed.

The painting strategy is used to divide the store or furniture workshop's walking areas (walkways) from the working areas (operation areas). When putting lines to divide walkways from operation areas, the following factors should be considered:

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- U-shaped cell designs are generally efficient that straight production lines.
- In-process inventory should be positioned carefully for best production flow.
- Floors should be levelled or repaired before we put lines.
- Walkways should be wide enough to avoid twists and turns and for safety and a smooth flow of goods.
- The dividing lines should be between 2 and 4 inches in width.
- Paint colors should be standardized. For example
 - operation areas are painted by green;
 - walkways are fluorescent orange or red;
 - Lines that divide the walkways from operation areas are yellow in color.

Dividing lines can be used to show:

- Cart storage locations,
- aisle directions,
- door range, to show which way a door swings open,
- for worktables,
- Tiger marks, to show areas where inventory and equipment should not be placed, or to show hazardous areas.



Color-code strategy: is used to show clearly which parts, tools, jigs and dies are to be used for which purpose. For example, if certain parts are to be used to make a particular product, they can all be color-coded with the same color and even stored in a location that is painted with that color. Similarly, as shown the picture in below, if different types of lubricants are to be used on different parts of a machine, the supply containers, oil cans, and machine parts can be color-coded to show what is used where.

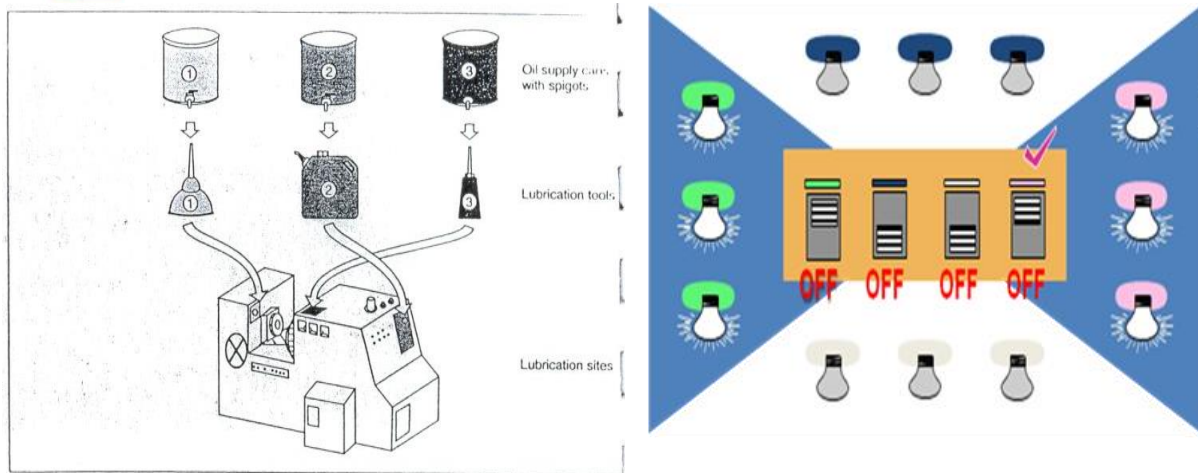


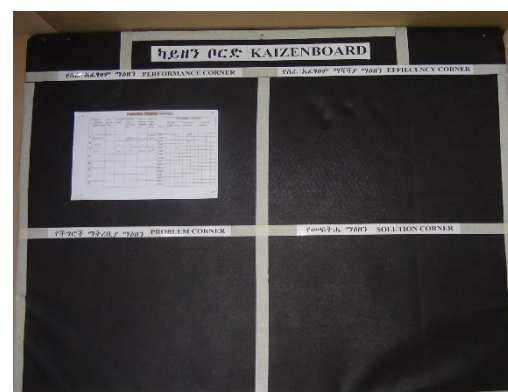
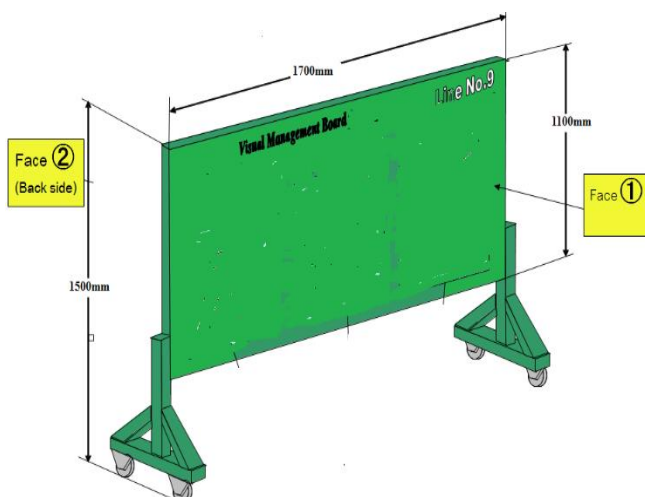
Fig. Color-coding for lubrication

Outlining strategy: is used to show which jigs and tools are stored where. Outlining simply means drawing outlines of jigs and tools in their proper storage positions. When you want to return a tool, the outline provides an additional indication of where it belongs.



Fig. Outlining of tools to show their locations

Visual Management Board (Kaizen board) Strategy



Self-Check 1	Written Test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

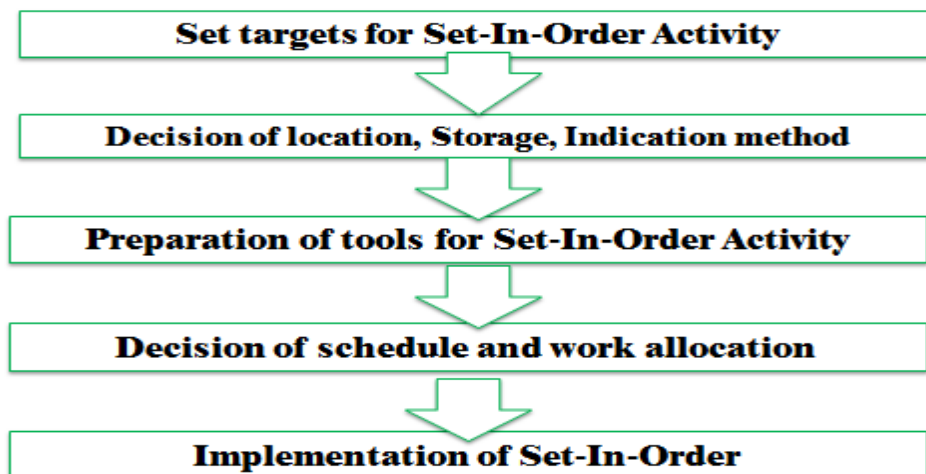
-
- 1) Give definition of the second pillar of 5S – Set in order. (3 points)
 - 2) List the benefits of implementing set in order? (4 points)
 - 3) Write procedures of set in order? (5 points)
 - 4) What are the strategies for implementing set in order? (3 points)
 - 5) What are the three standardized colors used for dividing and marking walkways and operation areas? (3 points)
-

Objective: - Trainers will be able to arrange workshop according to set in order strategy.

Tools and equipment's:- paint, plaster, brush, boards, tape, PPE

1) Sample plan sheet for implementing set in order

2) Procedures for implementing set in order



3) Steps for using 5S Map

1. Make a floor plan or area diagram of the workplace you wish to study. Show the location of specific parts, inventory, tools, jigs, dies, equipment and machinery.
2. Draw arrows on the plan showing the work flow between items in the workplace. There should be at least one arrow for every operation performed. Draw the arrows in the order that the operations are performed, and number them as you go.

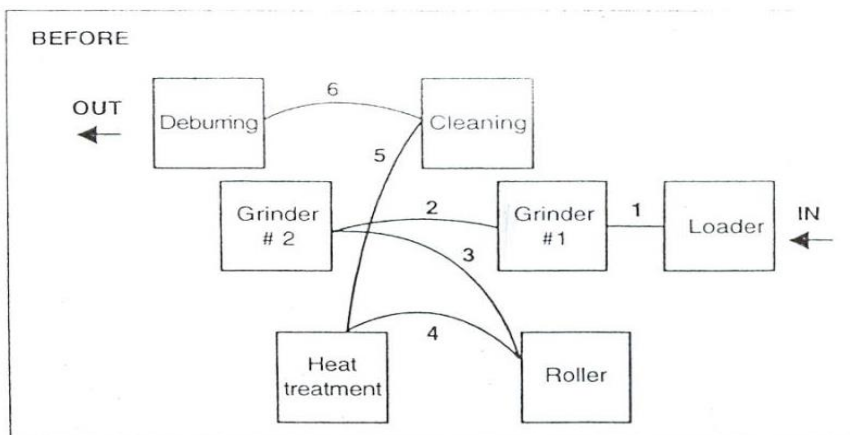


Fig. 5S Map of old layout in machining operations ('before map')

3. Look carefully at the resulting “spaghetti diagram”. Can you see places where there is congestion in the work flow? Can you see ways to eliminate waste?
4. Make a new 5S Map to experiment with a better layout for this work place. Again, draw and number arrows to show the flow of operations performed.
5. Analyze the efficiency of the new layout (the after map), based on the principles explained in the above.
6. Continue to experiment with possible layouts (after maps) using the 5S Map until you find one which you think will work well.

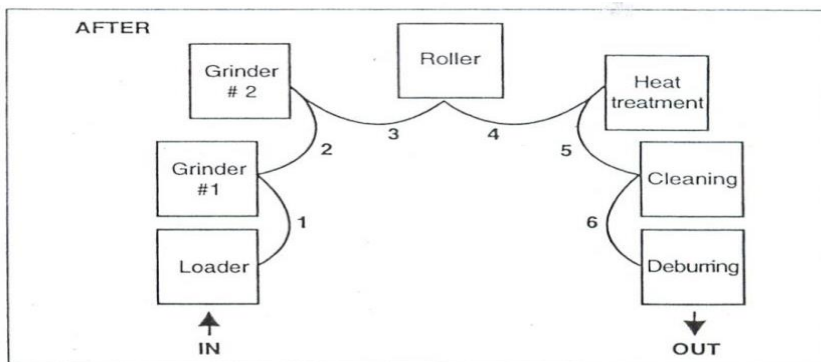


Fig. 5S Map of new layout (the after map) in machining operations

7. Implement this new layout in the work place by moving parts, tools, jigs, dies, equipment, and machinery to their new locations.
8. Continue to evaluate and improve the layout in the workplace.

LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks.

Task 1: Using the given template, prepare a plan for set in order activity in your workshop.

Task 2: Following the steps for using 5S Map, draw before and after map/ layout of your work shop.

Task 3: Following the procedures of set in order, perform set in order in the assigned workshop.

UNIT-FOUR

SHINE WORK AREA

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Keeping the work area clean and tidy
- Regular housekeeping and Inspection activities
- Regularly check that only essential items are in the work area.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Keep the work area clean and tidy
- Perform regular housekeeping and Inspection activities

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. Perform “the Learning activity performance test” which is placed following,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

4.1. Explanation of Shine

4.1.1. Definition of Shine

The third pillar of 5S is shine. Shine means sweeping floors, wiping off machinery and generally making sure that everything in the factory stays clean. In a manufacturing company, shine is closely related to the ability to produce quality products. Shine also includes saving labor by finding ways to prevent dirt, dust, and debris from piling up in the workshop. Shine should be integrated in to daily maintenance tasks to combine cleaning checkpoints with maintenance checkpoints.



Fig. Worker shinning the floor.



Fig. Worker shinning machines

Cleaning is so important because when we clean an area, we are also doing some inspection or checking of machinery, equipment, and work conditions. An operator cleaning a machine can find many mal-functions. When a machine is covered with oil, soot, and dust, it is difficult to identify any problems that may be developing. While cleaning the machine, however, one can easily spot oil leakage, a crack developing on the cover, or loose nuts and bolts. Once these problems are recognized, they are easily fixed.

It is said that most machines breakdowns begin with vibration (due to loose nuts and bolts), with introduction of foreign particles such as dust (due to the crack on the cover, for instance), or with

inadequate oiling and greasing. For this reason shine is useful to make discoveries while cleaning machines. Hence, shine means cleaning the workplace's floors, equipment and facilities, provide inspection at the same time, and ensure that they are in good operating condition.

4.1.2 Benefits of shine

One of the more obvious purposes of shine is to turn the workplace in to clean, bright place where everyone will enjoy working. Another key purpose is to keep everything in top condition so that when someone needs to use something, it is ready to be used. Companies or organizations should avoid the tradition of annual at the end of the year or on spring cleanings. Instead, cleaning should become a deeply ingrained part of daily work habits, so that tools, equipment, and work areas will be ready for use all the time.



Fig. Worker cleaning and lubricating woodwork machines

Cleanliness for factories and offices is a lot like bathing for human beings. It relieves stress and strain, removes sweat and dirt, and prepares the body and mind for the next day. Cleanliness is important for physical and mental health. Just as you would not bath only once a year, performing shine procedures in a factory should not be an annual activity. Cleaning should be done on daily basis.

Shine activities can play an important part in bringing work efficiency and safety. Cleanliness is also linked with the morale of employees and their awareness of improvements. Factories or workshops that do not implement the shine pillar suffer the following types of problems:

1. Poor morale and inefficiency at work. This could be due to dirty windows that can pass only little light.
2. Unable to see or find defects in dark and messy workplaces.
3. Slipping and injuries can be created due to puddles of oil and water on the floor.
4. Frequent breakdown of machines due to insufficient check-ups and maintenances which in turn leads to late deliveries.
5. Low and unsafe operating machines due to insufficient checkups and maintenance which in turn leads to hazard and accidents.
6. Defects will result due to shaving cuts getting mixed in to production or assembly processes.
7. Shaving cuts can get in to people's eyes and create injuries.
8. Low morale due to filthy work environments.

4.2. Implementing Shine

4.2.1. Plan and procedures for shine activities

Shine activities should be taught as a set of steps and rules that employees learn to maintain with discipline. The following sample format can be used to prepare a plan for implementing shine activities.

Table: Shine activity plan sheet (sample)

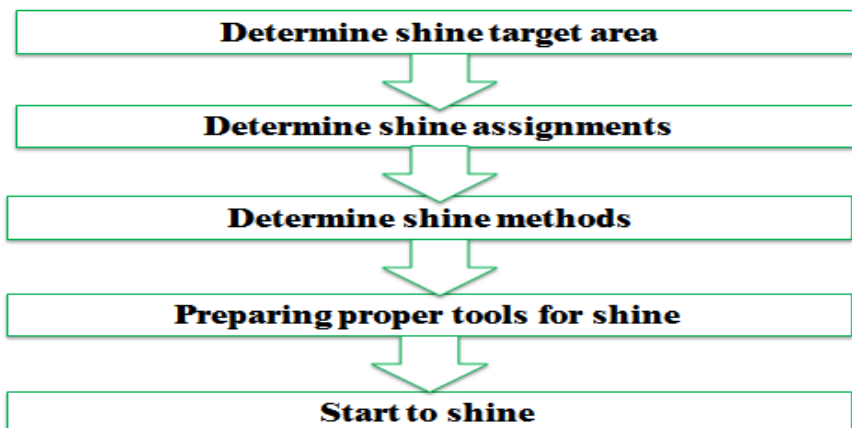
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			November 2022

Area : M-1

Preparation date: Year Month Day
Prepared by 5S Committee

Basic Plan		Seisou Activity																														
		5th month																														
Activity		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Preparing necessary tools	Plan																															
	Result																															
Determining activity area	Plan																															
	Result																															
Designing procedures for the Seisou Activity	Plan																															
	Result																															
General cleaning	Plan																															
	Result																															
Working out the problems revealed through the general cleaning	Plan																															
	Result																															

Procedures for shine



Step 1: Determine shine target areas

Shine target areas are grouped in to three categories: warehouse item, equipments and space. *Warehouse items* include raw materials, procured subcontracted parts, parts made in-house, and assembly components, semi-finished and finished products. *Equipment* includes machines, welding tools, cutting tools, conveyance tools, general tools, measuring instruments, dies, wheels

and castes, worktables, cabinets, desks, chairs and spare equipment. *Space* refers to floors, work areas, walkways, walls, pillars, ceilings, windows, shelves, closets, rooms and lights.

Step 2: Determine Shine Assignments

Workplace cleanliness is the responsibility of everyone who works there. Each employee should be assigned specific area to clean. To do this two methods can be used:

- A 5S Assignment Map – shows all the target areas for shine activity and who is responsible for cleaning them. By marking on 5S Map, the shine assignments can be shown.
- A 5S schedule – shows in detail who is responsible for cleaning which areas on which days and times of the day. Then this schedule should be posted in the work area.

Example 1:

General Cleaning Assignment Sheet						
Activity area		Target place/object	Group	Leader	Tools	Required number of workers
Zone A	Machining-- Group A area	Lathe	Manufacturing	A	Detergent	25
		Press machine			Waste cloth	
		Floor			Scraper	
	Machining-- Group B area	Resting-place			Broom	
		Pathway			mop	
	Machining-- Group C area					
Zone B	Purchasing area					
	Material area					
Zone C	Painting area					
	Processed products discharge area					

Example 2:

Regular Cleaning Assignment Sheet												
Worksite			Group						5S promoter			
No.	Day	Target place/object	Person in charge						Frequency	Time	Start	Tool
			A	B	C	D	E	F				
1	Mon											
2												
3												
4	Tue											
5												
6												
7	Wed											
8												
9												
10	Thu											
11												
12												
13	Fri											
14												
15												

Step 3: Determine shine methods

Shine activities should be a natural part of the daily work. Shine activities and inspection should be done before a shift starts, during work time and at the end of the shift.

Determining shine methods include:

- *Choosing targets and tools* – define what will be cleaned in each area and what supplies and equipment's will be used.
- *Performing the five-minute shine* – cleaning should be practiced daily and should not require a lot of time.
- *Creating standards for shine procedures* – people need to know what procedures to follow in order to use their time efficiently. Otherwise, they are likely to spend most of their time getting ready to clean.

Step 4: prepare tools

The cleaning tools including brooms, brushes, vacuum cleaner, trash basket, mop, dust collector etc... should be placed properly or set in order where they are easy to find, use and return.

Step 5: Start to shine

When implementing the shine procedures, consider the following suggestions:

- Be sure to sweep dirt from floor cracks, wall corners, and around pillars.
- Wipe off dust and dirt from walls, windows, and doors.
- Be thorough about cleaning dirt, scraps, oil, dust, rust, cutting shavings, sand, paint, and other foreign matter from all surfaces.
- Use cleaning detergents when sweeping is not enough to remove dirt.

4.3. Regular Housekeeping Inspection Activities

As discussed earlier, it is natural to do a certain amount of inspection while implementing shine activities. Once daily cleaning, during shift and periodic major cleanups become a habit, we can start incorporating systematic inspection procedures in to the shine procedures. Even when equipment in the workplace appears to function normally, it may be developing many problems. Always when machines or other equipment begin to show sign of minor, sporadic malfunctions, the operators not the maintenance people notice it first. Therefore, it is important to consider the operators information about the equipment.

The following types of equipment problems frequently exist in factories:

1. Oil leaks from the equipment on to the floor.
2. Machines are so dirty that operators avoid touching them.
3. Gauge displays and other indicators are too dirty to be read.
4. Nuts and bolts are either loose or missing.
5. Motors overheat.
6. Sparks flare from power cords.
7. V-belts are loose or broken.
8. Some machines make strange noises.

Daily cleaning or inspection can help to find these problems and solve them.



4.3.1. Inspection steps

The steps of inspection and shine procedures are parallel. But the steps of inspection give greater emphasis on the maintenance of machines and equipment. These steps are:

Step 1: Determine inspection targets

The targets for inspection are similar to the targets of shine activities. These include machines, equipment, jigs, dies, cutting tools and measuring instruments.

Step 2: Assign inspection activities

In principle, the people who carry out inspection on a particular machine should be the same people who operate the machine. But most often one person can operate several machines at a time (as in multi-process handling). In this case, it is good to involve line supervisors and group

leaders in the inspection duties. Once inspection activities are assigned, they have to be written up on a large signboard for the workshop or on small signboards that are attached to each target machine.

Step 3: Determine inspection methods

First all of the items to be inspected should be listed then an inspection checklist should be prepared based on the listed inspection items.

The following shows an example of an inspection checklist.

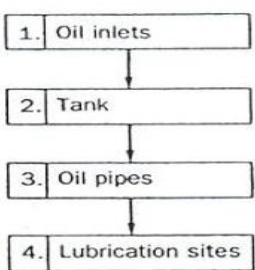
Mechanism	No.	Point	Main Response			
			Clean	Lubricate	Replace	Restore
Lubrication system 	26.	Is there any dirt or dust in the oil inlets?	<input type="radio"/>			
	27.	Do the oil level indicators show adequate levels?		<input type="radio"/>		
	28.	Can the oil level indicators be clearly seen?				
	29.	Are there any cracks in the oil tank?	<input type="radio"/>			<input type="radio"/>
	30.	Is the bottom of the oil tank dirty?	<input type="radio"/>			<input type="radio"/>
	31.	Is the oil in the tank dirty?	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>
	32.	Is there any oil leakage from the tank or pipe joints?			<input type="radio"/>	<input type="radio"/>
	33.	Are oil levels adequate?		<input type="radio"/>		<input type="radio"/>
	34.	Is the correct type of oil being used?			<input type="radio"/>	<input type="radio"/>
	35.	Is there any clogging in the oil pipes?			<input type="radio"/>	<input type="radio"/>
	36.	Is there any dust or dirt at lubrication sites?	<input type="radio"/>			<input type="radio"/>
	37.	Are the lubrication tools dirty?	<input type="radio"/>			<input type="radio"/>

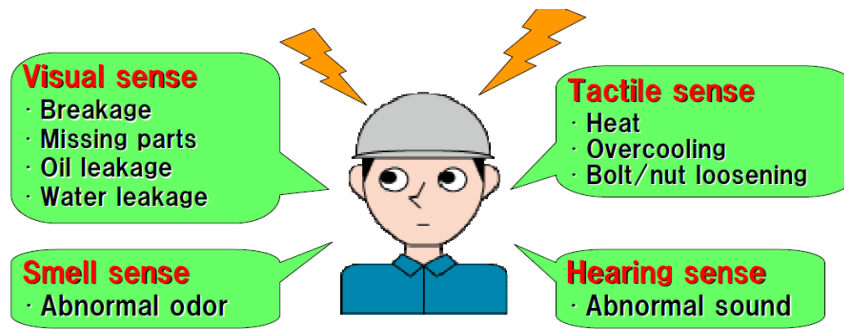
Fig: Sample of inspection checklist

Step 4: Implement inspection

When implementing inspection, use all your senses to detect abnormalities. Inspection is not simply a visual activity. There are some ways to detect abnormalities. These are:

- Look closely at how the machine works and watch for slight defects (e.g. oil leakage, debris scattering, deformation, wear, warping, mold, missing items, lopsidedness, inclinations, color changes).
- Listen closely for changes in the sounds the machine makes while operating (e.g. sporadic sounds, odd sounds).

- Use your nose to detect burning smells or other unusual odours (e.g. burning rubber)
- Touch the machine where it is safe during operation and during downtime to detect deviations from normal conditions (e.g. strange vibrations, wobbling, looseness, excessive heat, shifting).



Step 5: Correct equipment problems

All equipment abnormalities or slight defects should be fixed or improved. There are two approaches to do these:

Instant Maintenance: whenever possible, an operator should immediately fix or improve a problem he or she discovers during inspection. But the operators should know what level of maintenance work they can handle by themselves and immediately.

Requested Maintenance: In some cases, a defect or problem may be difficult for the operator to hand alone and immediately. In this situation, the operator should attach a maintenance card to the site of the problem in order to make it visible. He or she can also issue a maintenance kanban to request help from the maintenance department. It is also good to log requested maintenance on to a checklist of needed maintenance activities. Once a requested maintenance is taken care and its result confirmed, the activity should be checked off in the 'confirmation' column of the checklist. The maintenance card should then be retrieved from the machine where it is attached.

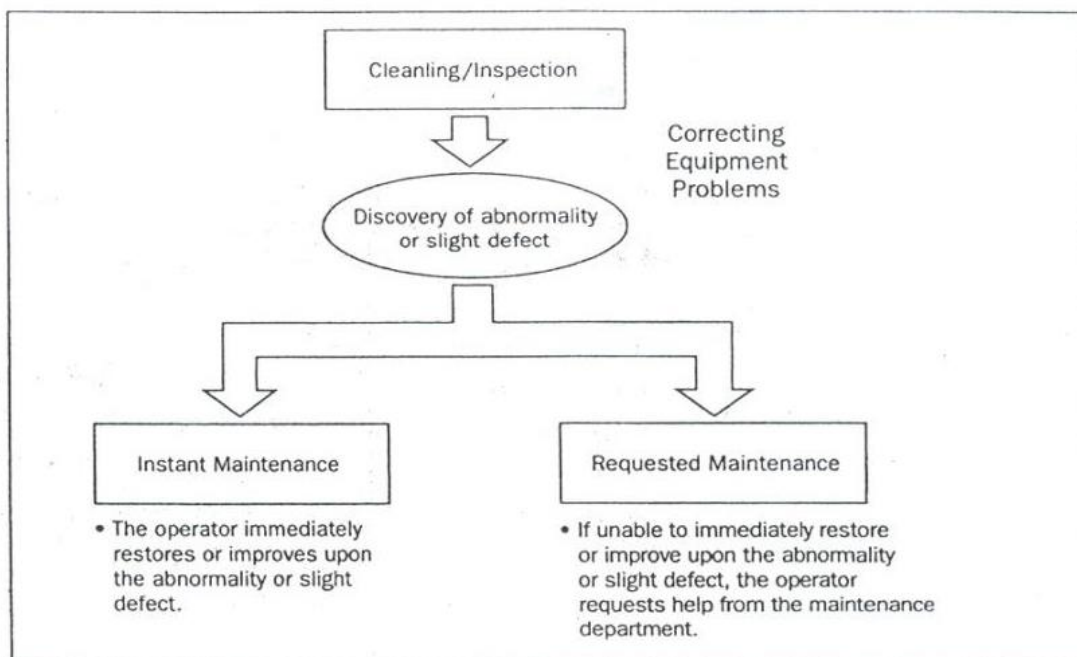


Fig. Two approaches for solving equipment problems

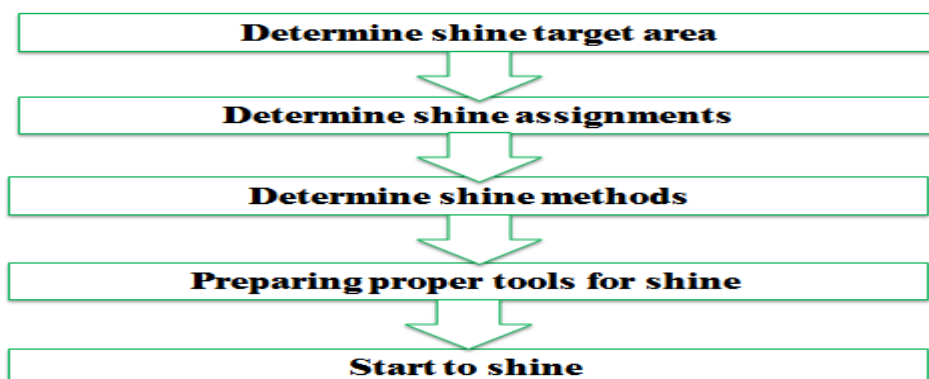
Self-Check 1	Written Test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

-
1. Give definition of the third pillar shine. (2 points)
 2. What problems occur in a workshop if shine is not implemented? (8 points)
 3. What are the steps/procedures for implementing shine? (5 points)
 4. What are the two methods used to assign shine activities to employees? (2 points)
 5. What are the most frequent problems of equipment/machines? (4 points)
 6. List the steps of inspection. (5 points)
 7. How do you detect abnormalities in a workplace or machine? (4 points)
-

Operation Sheet 1	Implementing shine activity
-------------------	-----------------------------

1) Procedures for implementing Shine



2) Prepare plan for shine

Sample plan for shine

Area : M-1

 Preparation date: Year Month Day
 Prepared by 5S Committee

Basic Plan		Seisou Activity																														
		5th month																														
Activity		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Preparing necessary tools	Plan																															
	Result																															
Determining activity area	Plan																															
	Result																															
Designing procedures for the Seisou Activity	Plan																															
	Result																															
General cleaning	Plan																															
	Result																															
Working out the problems revealed through the general cleaning	Plan																															
	Result																															

Sample format for general cleaning assignment

General Cleaning Assignment Sheet						
Activity area		Target place/object	Group	Leader	Tools	Required number of workers
Zone A	Machining-- Group A area	Lathe	Manufacturing	A	Detergent	25
		Press machine			Waste cloth	
		Floor			Scraper	
	Machining-- Group B area	Resting-place			Broom	
		Pathway			mop	
	Machining-- Group C area					
Zone B	Purchasing area					
	Material area					
Zone C	Painting area					
	Processed products discharge area					

Sample format for regular cleaning assignment

Regular Cleaning Assignment Sheet										
Worksite			Group						5S promoter	
No.	Day	Target place/object	Person in charge						Frequency	Time
			A	B	C	D	E	F	Start	Tool
1	Mon									
2										
3										
4	Tue									
5										
6										
7	Wed									
8										
9										
10	Thu									
11										
12										
13	Fri									
14										
15										

3) Steps in inspection

- Step 1: Determine inspection targets
- Step 2: Assign inspection activities
- Step 3: Determine inspection methods
- Step 4: Implement inspection
- Step 5: Correct equipment problems

LAP Test	Practical Demonstration
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Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks.

Task 1: Using the given template, prepare a plan for shine activity in your workshop.

Task 2: Following the shine procedures, perform shine activity in the assigned workshop.

Task 3: Following the steps for inspection, perform inspection of equipments, tools and machines in your workshop.

UNIT-FIVE

STANDARDIZE ACTIVITIES

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Procedures of Standardizing activities
- Standardizing activities using checklists
- Keeping work area standard

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Follow procedures of Standardizing activities
- Perform standardizing activities using checklists
- Keep the standard of work area.

Learning Instructions:

9. Read the specific objectives of this Learning Guide.
10. Follow the instructions described below.
11. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
12. Accomplish the “Self-checks” which are placed following all information sheets.
13. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
14. Perform “the Learning activity performance test” which is placed following,
15. If your performance is satisfactory proceed to the next learning guide,
16. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Standardize-It is the method you use to maintain the first three pillars of 5S. The result that exists when the first three pillars are properly maintained

Standardize: Standardize means maintain organized and clean workplaces by making Sort, Set in Order, and Shine activities integrated into everyone's regular work.

Standardize (Samalitsani, Seiketsu):- is activities which establish a regular and continuous practice of maintaining tidiness, orderliness, and cleanliness (first 3-Ss). All processes and procedures of the organization are standardized to reduce the cycle time, to reduce waste, to improve safety and to improve outcome.

Thus, the following kinds of activities are implemented in this phase:

- Development of Standard Operational Procedures (SOPs),
- Display marking of safety signs
- Garbage segregation system (infectious/non-infectious, recyclable), following the Infection Prevention and Control / Healthcare Waste Management policy
- Color cording for linen system
- Zoning for storing/parking products.

Benefits from standardize

- Consistency across all branches of the operation. This means in the workshops, ware house store, finished furniture store, office etc .
- Minimizes guesswork. When there is consistency, companies know what to expect and are more prepared to handle problems as they arise.
- Ensures that the company continuously reaps the benefits of sorting, order, and cleanliness.
- Improvement in Morale. Employee input is always considered in all processes of the 5S system. This process demonstrates that the company values and respects worker opinions.
- Encourages accountability. Roles and responsibilities are clearly defined. Employees are well-trained and understand what is expected of them.

In general the benefits can be summarized as:-

- Lead to workplace standardization
- √ Prevent setbacks in the first 3 pillars.

- √ Make implementing them a daily habit.
- √ Ensure that the first 3 pillars are maintained in their fully implemented state.
- Lead to work standardization
 - √ Muda elimination
 - √ Quality improvement
 - √ Cost, delivery time & Quality improvement.



Fig. Standardize wood workshop



Fig. standardize tools placement

How to Implement Standardization

The three steps to make the 3S a habit are:

Step 1: Decide who is responsible for which activities with regard to maintaining 3S conditions.

Step 2: To prevent backsliding, integrate 3S maintenance duties in to regular work activities.

Step 3: Check on how well 3S conditions are being maintained.

Step 1: Assign 3S Responsibilities

Everyone must know exactly what they are responsible for doing and exactly when, where and how to do it.

Tools for assigning 3S responsibilities include:

- 5S Maps
- 5S schedules
- 5S job cycle charts

5S Map

1. Demarcation for each teams (raw materials like lumber, equipment with the same use, semi-finished parts, finished furniture...)
2. Who is responsible for each block (ware house, finished furniture stores, finishing lines, ...)

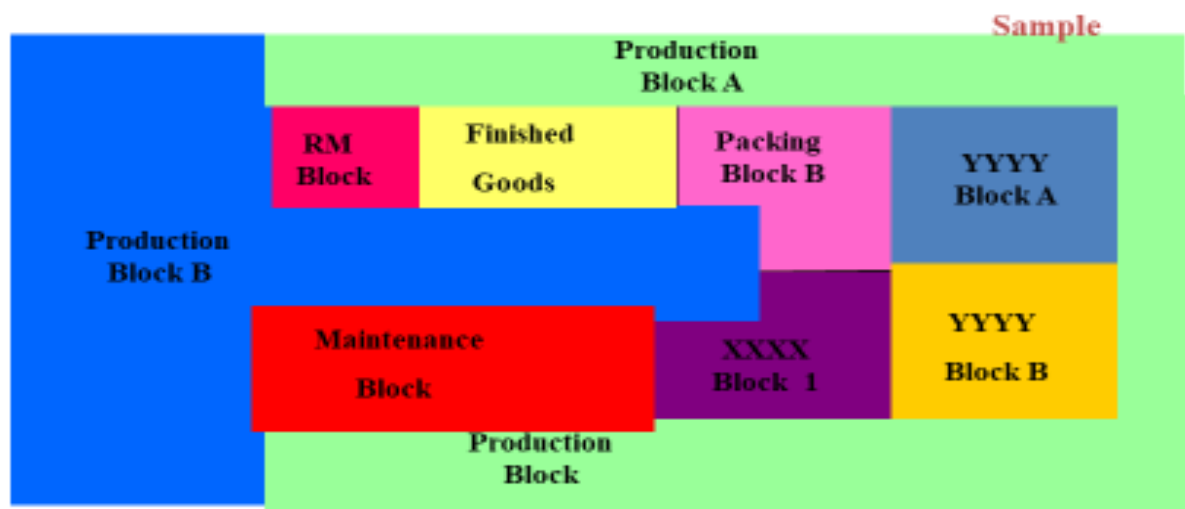


Fig. 5S Map

5S schedules

- This schedule shows in detail who is responsible for each 5S activity.
- The 5S schedule should be posted in the work area.

Type of cleaning	Time	Frequency (timing)	Responsibility
Daily cleaning	5 – 10 min.	Minor operation before/after working	Team A, Team B
Weekly cleaning	15 – 30 min.	Weekend	Mr. X and Mr. Y
Monthly cleaning	30 – 60 min.	End of month	All employee
General cleaning several times a year	2 – 4 hrs	Before consecutive holidays	All employee
Location which is not easy to clean	1 – 2 days	In case of necessity for assistance request to	Team C

5S job cycle

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- lists the 5S jobs to be done in each area, and set frequency cycle for each job

5S job cycle		Division. Department		Production division								
		Entered by:		Mr. X		Date			Feb.12.2016			
No.	5S Job	Sort	Set in order	shine	Stand ardize	sustain	A	B	C	D	E	F
1	Red tagging strategy (occasional. companywide)	●									●	
2	Red tagging strategy (repeated).	●					●					
3	Place indicator. (check and make)		●						●			
4	Item indicator (check and make)		●						●			
5	Amount indicator (check and make)		●						●			
6	Sweep around line			●				●				
7	Sweep within line			●				●				
8	Sweep around workplace			●				●				
9	Sweep on and under workplace			●				●				
10	Sweep work areas and walkways			●				●				

Step 2. Integrate 3S Duties into Regular Work Duties

- Maintenance must become a natural part of everyone's regular work duties.

Two approaches

- ✓ Visual 5S and
- ✓ Five-Minute 5S

Visual 5S

- This approach makes the level of five pillar conditions obvious at a glance.
- The main point of Visual 5S is that anyone should be able to distinguish between abnormal and normal conditions at a glance.

Five-Minute 5S

- The term "Five-Minute 5S" is a loose one-the actual time can be three minutes, six minutes, or whatever is appropriate.
- The point is to make the five pillar work brief, efficient, and habitual.

Example:- Instead of following two hours for removing all of the cutting shavings from the floor, we can set up a half-hour or a one-hour Shine procedure that accomplishes the same task.

Step 3. Check on 3S Maintenance Level

- After we have assigned the three pillar jobs and have incorporated the three pillar maintenance into the everyday work routine, we need to evaluate how well the three pillars are being maintained. For this, we can use a Standardization-level Checklist as shown in the figure below.

Standardization-level Checklist

Standardization-Level Checklist		Dept.: Assembly Dept. 1	Feb. 15, 1994		
		Assigned area	Entered by: McCarthy	Page 1	
No.	Process and checkpoint	Sort	Set in Order	Shine	Total
1.	Work at Line A, Process 1	1 2 3 (4) 5	1 (2) 3 4 5	1 (2) 3 4 5	8
2.	"	1 (2) 3 4 5	1 2 (3) 4 5	1 2 (3) 4 5	8
3.	"	1 (2) 3 4 5	1 (2) 3 4 5	1 (2) 3 4 5	6
4.	"	1 (2) 3 4 5	1 2 (3) 4 5	1 (2) 3 4 5	7
5.	"	1 2 (3) 4 5	1 2 (3) 4 5	1 2 3 (4) 5	10
6.	"	1 2 3 (4) 5	1 2 3 (4) 5	1 2 3 (4) 5	12
7.	Average and total for Line A	1 2 (2.6) 3 4 5	1 2 (2.8) 3 4 5	1 2 (2.8) 3 4 5	(50)

Information Sheet-2	Standardizing activities using checklists
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Self-Check 1	Written Test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. Give definition of the standardization in 5S. (2 points)
2. What are the tree steps to make 3S habit? (8 points)
3. List the benefits of standardize? (5 points)
4. What are the benefits of 5Smap?
5. _____makes the level of five pillar conditions obvious at a glance (2points)

Standardizing activities

It is important that a Standard Work is created by the people who do the work. A standard work should not resemble an edict from the top-management. It should be a collaborative effort of the team members who it most impacts. When a Standard work is “given”, it will be treated as an instruction or a task to be accomplished whereas if the team members are involved in creating a standard work, it becomes a commitment. Not only they assume ownership in executing the processes but also accept accountability.

“**Checklists**” should be developed for each activity/service area and utilize it for the standardization.

For the success of standardization equalization is important to reduce variance of quality. The variability is the cause of creating needless work in the workflow. Therefore, consider equalizing the followings:

- Individual capacity:
 - √ Information sharing and development of Standard Operational Procedures
- Quality, Productivity and Safety:
 - √ Use of Standard Operational Manual and Standard Operational Procedures for using equipment, machine and making of furniture
- Staff’s mind-set towards to KAIZEN activities:
 - √ Fair performance evaluation and awards to good practice, equal opportunity of training to all staff
- Information:
 - √ Sharing among staff of policy and strategy for quality improvement and current situation of KAIZEN activities

To take standardization to a higher level, we must ask "why?"

- Why do unneeded items accumulate (despite Sort procedures)?
- Why do tools get put back incorrectly (despite Set in order procedure)?
- Why do floors get dirty (despite Shine procedures)?
- Ask "why" repeatedly, to find the source of the problem and address that source with a fundamental improvement.

Such improvements can help us develop Unbreakable standardization, which means:

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5S Standardization Checklist



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MINISTRY OF HEALTH-ETHIOPIA

Date:

Office NO:	Total score (# of Yes / 21	
------------	-------------------------------	--

- Unbreakable sorting
- Unbreakable setting in order
- Unbreakable setting shining

Sort (get rid of what's not needed):		
- Unnecessary items have been removed from the area (scraps around the machine and on the floor, storage, and things on walls...)	Y	N
- any incomplete work has been completed or removed to be resolved separately	Y	N
- a red tag area is used to hold items requiring decisions (no item more than 7 days old)	Y	N
- work surfaces, drawers and storage areas do not have items in or on them that don't belong	Y	N
Set in order (organize):		
- all work surfaces, storage areas, equipment and machines are clearly marked and well organized	Y	N
- locations and containers for items and supplies are clearly marked	Y	N
- incomplete work or items requiring special attention are separated and clearly marked	Y	N
- Standard information boards have been established (for measurement and management info.)	Y	N
Shine (clean and solve):		
- Floors, work surfaces, equipment, machines, workshops and bureaus are clean (including the corners!)	Y	N
- garbage and recyclables are collected and disposed of correctly	Y	N
- Work environment is good (air quality, temperature, lighting, dust, fumes, floors...)	Y	N
- when the clean-up activities expose a problem, it is promptly solved and corrective action taken	Y	N
Standardize (tasks):		
- roles are identified for keeping the area clean and orderly (standardization check list implemented)	Y	N
- standard tasks related to cleaning and organizing are defined	Y	N
- it is obvious through visual management tools whether tasks have been done	Y	N
-This standardization is maintained daily activities (5miniuts for 5s is active).	Y	N
Sustain (keep it up):		
- posted Standard Work is being followed	Y	N
- standard cleaning and work procedures are being followed (standardization checklist activities sustained and improved)	Y	N
-documents and instructions are current (improvement of visual displays)	Y	N
- standard kaizen boards are being used and have current, relevant information	Y	N
- work area is clean, neat and orderly with no serious unsafe conditions observed	Y	N
Total Score :		
Comments		
Sort (get rid of what's not needed):		

Set in order (organize):
Shine (clean and solve):
Standardize (tasks):
Sustain (keep it up):

Self-Check 2	Written Test
--------------	--------------

Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. Who should prepare standard work in the work area? (2 points)
2. What is the method to take standardization to the higher level? (2 points)
3. List the major contents in 5S standardize checklist? (4 points)
4. What are the benefits of 5Smap? (2 points)

UNIT-SIX

SUSTAIN 5 S

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Sustaining clean up
- Identifying non-compliance and taking actions
- Inspecting work area regularly
- Recommending improvements in the workplace

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to:**

- Sustain clean up
- Identify non-compliance and taking actions
- Inspect work area regularly
- Recommend improvements in the workplace

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. Perform “the Learning activity performance test” which is placed following,
7. If your performance is satisfactory proceed to the next learning guide,
8. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Sustaining

Sustain is self-discipline to maintain consistent practice of 5S. It focuses on taking all of the previous steps of 5S, including the standardized procedures, and transforming them into ongoing habits to ensure continuous improvement. Just having a basic system in place is not enough, and the existence of the Sustain step is a testament to this. When workers are required to do something new in the workspace, it will not become an automatic habit right away; it takes people time to actually form longstanding habits.

Benefits of sustain

1. Improvements will last and deliver the gains—the cost reductions and quicker production times that give you a competitive advantage.
2. Equipment & machines will remain running efficiently (greater percentage of uptime).
3. The workforce will realize that the management team is serious about continuous improvement and follow their lead.
4. Morale will improve, because people prefer to work in an organized and clean workspace.
5. Safety improvements will remain intact.
6. Employees will feel empowered and realize they have some control over their work environment.
7. Now that tools and supplies are not misplaced, there will be a reduction of replacement spending.

Cleanup in sustain

Cleanup (shine) is among the five pillars of kaizen. This activity makes the work area to be tidy clean and attractive for the workers. Cleanup in wood work company is very crucial because the work shop is always scraps dust and different size and type of lumbers. So, setting up schedule for cleaning machines, tools, equipment and floor before starting shift and ending shift and during shift is needed.

We should not forget to sustain each pillar of the kaizen activity, which means, Sort, set in order, standardize. All are equally important in the implementation process. Disorganized and dirty work areas undoubtedly affect efficiency and decrease motivation. This is why equally

implementation of 5S boosts companies' performance in many ways. For instance, it allows for waste elimination and improves industrial safety.

Conditions that help to sustain

- **Awareness:**
 - √ Need to understand what the five pillars are and how important it is to sustain them.
- **Time:**
 - √ Need to have or make enough time in your work schedule to perform 5S implementation.
- **Structure:**
 - √ Need to have a structure for how and when 5S activities will be implemented.
- **Support:**
 - √ Need to have a support for your efforts from management in terms of acknowledgement, leadership, and resource.
- **Rewards and Recognition:**
 - √ The efforts need to be rewarded.
- **Satisfaction and Excitement:**
 - √ The implementation of the five pillars needs to be fun and satisfying for you and the company.
 - √ This excitement and satisfaction gets communicated from person to person, allowing 5S implementation to build as it involves more people.

In sustaining 5S everybody in the company have their own role which means implementation of 5S is a collective effort. Let us see the role of the management and works separately in sustaining 5S.

The Role of Management to Sustain

- Educating workers about 5S concepts, tools, and techniques.
- Creating team for implementation.

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- Allowing time for implementation and creating schedules for this work.
- Providing resources for 5S implementation. such as supplies.
- Acknowledging and supporting 5S efforts
- Creating both tangible and intangible rewards for 5S efforts
- Promoting ongoing 5S efforts
- Encouraging creative involvement by all workers, listening to their ideas, and acting on them

Workers' Role to Sustain

- Continuing to learn more about 5S implementation.
- Helping to educate your coworkers about the 5S.
- Being enthusiastic about 5S implementation. □Helping to promote 5S implementation efforts.
- Taking the initiative to figure out ways to implement the five pillars in your work on a daily basis.
- Asking your supervisor or manager for the support or resources you need to implement the five pillars.
- Participating fully in company 5S implementation efforts.
- Bringing to your supervisor or manager your creative ideas for promoting or implementing the five pillars.
- Participating fully in company 5S promotion efforts.

Some techniques to sustain

- Patrolling system
- 5S Slogan & 5S posters
- Awarding systems
- 5S audit
- 5S newsletter and kaizen board
- Big cleaning day
- 5S photo exhibits & storyboards

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- 5S maps
- 5S pocket manuals
- 5S month
- Department/Benchmarking tour

Let us see some of the techniques

Use Slogan and Poster of 5S Activity

- 5S Slogans can be displayed on buttons, stickers, flags, or posters.
- It encourages all the participants.

Samples of slogan

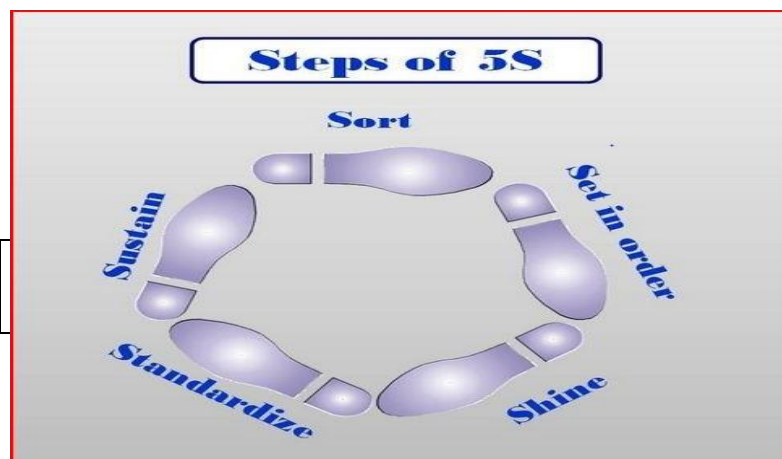
“Refresh yourself and workplaces by 5S activity.”

“Let's maintain current 5S activity and KAIZEN for tomorrow.”

“We polish “Our Minds” as well as our factories.”

Sample of poster

Posters serve to remind everyone of the importance of the five pillars, or to communicate the results or status of 5S activities.



Awarding System

- Awarding for 5S promotion results according to evaluation is recommended.

Awards are may be

- For good performance
- Award for efforts
- Award for good Ideas

Prize winner will be -Group

- Individual

5S Newsletter

- 5S Newsletters are in-house news bulletins on 5S conditions and activities.
- 5S Newsletters are most effective when issued on a regular basis, once or twice a month and at staff meetings.

Big Cleaning Day

- It is a cleaning that carried out from two to four hours by the organization.

5S Photo Exhibits and Storyboards

“A picture is worth a thousand words“.

- Photo Exhibits and Story boards show the before and after of 5S implementation activities

5S Months

- Companies should designate two, three, or four months every year as "5S Months." During these months, various activities such as 5S seminars, field trips, and contests can be carried out to promote 5S implementation in the company.

5S Maps

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- 5S Maps can also be used to get employees involved in five pillar improvement on an ongoing basis.
- 5S improvement Maps should be hung in a central location with suggestion cards attached so anyone can suggest improvements.

5S Pocket Manuals

- A 5S Pocket Manual can be created that contains five pillar definitions and descriptions, and is small enough to fit into the pocket of work clothes.
- Shop floor workers, supervisors, and managers can all use 5S Pocket Manuals for easy reference to the 5S essentials.

5S Department Tours

- When one department in a company has implemented the five pillars successfully, it can serve as a model area for other departments to come visit. Since "seeing is believing," this technique is extremely effective for promoting 5S implementation throughout a company.

Self-Check 1	Written Test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. Define sustain? (2 points)
 2. Write the benefits of sustain? (2 points)
 3. What are the conditions the help 5S to sustain? (4 points)
 4. List the role of management in sustain? (2 points)
 5. List the role of workers in sustain? (2 points)
 6. Write at least five techniques that help to sustain? (3 points)
-

Information Sheet-2	Identifying non-compliance and taking actions Inspecting work area regularly
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Identifying Non-compliance of standards set in 5S implementation inspecting work area regularly are activities that are performed simultaneously. This activities will be performed by using some of the above sustaining techniques.

1. Patrolling

- **Top management Patrol Must**
 - √ Check Up the activities Comprehensively
 - √ Give emphasis on sustaining of the activity
 - √ consider committees feedback



- **5S Audit Committee members and Promotion office Patrol**
 - √ Evaluate using “5S Check List”
 - √ Record problems on”5S check findings”
 - √ Tack picture of 5S problems
- **Mutual patrol**
 - Check mutually among 5S groups
- **Self-patrol**

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- 5S leader and members check the results of activity by themselves.
- **Checklist patrol**
 - Point out the problems by themselves at site as well as evaluate the results and encourage members to urge KAIZEN.
- **Camera patrol**
 - Visibly highlight the problems and progress of the activity using photographs.

2. 5S AUDIT COMMITTEE

The 5S committee

- Develop 5S evaluation criteria, guidelines and stickers.
- Develop schemes Scoring point and on measuring impact of audit; achievement level.
- Develop guidelines to aid in effective standardization of improvement projects.
- Schedule audit activities.
- Submit audit summary every month to the Top Management.

5S Audit Committee

Twelve Focal Points 5S Auditors Should Examine

- Do the Top and Middle managers support 5S program?
- Are people proud of their workplaces?
- Are workplaces clean and organized?
- Are workplaces safe for people to work in?
- Are machines and equipment clean and well maintained?
- Are items easy to retrieve?
- Are machines and tools conveniently located?
- Are inventories stored for FIFO retrieval?
- Are products free from dust?
- Do people clean daily without prompting?
- Are the uniforms worn by people clean and tidy?
- Is a good image of the enterprise reflected in its people?

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After examining the above points and sorting out non-compliance of 5S implementation the committee should identify the root cause for further action. The measure we will take is dependent on the cause of the non-compliance. What so ever the action is the objective is eliminating the problem and make sure the 5S implementation is become habit across the organization.

CRITERIA FOR 5S AUDIT RATING

RATING ACCORDING TO SCALE 1 TO 5

Developing 5S evaluation criteria for evaluation of overall activity like the table below helps to do it properly.

Evaluation Scale	5S Practice	5S Theory	Data/Fact
1 (0 - 30 %)	<ul style="list-style-type: none"> Nothing at all and no sense of commitment. Not doing 5S at all. 	<ul style="list-style-type: none"> No knowledge and cannot explain. 	<ul style="list-style-type: none"> No data. No improvement effort.
2 (31 - 50 %)	<ul style="list-style-type: none"> Doing some but not sufficient. Doing before auditors arrival. 	<ul style="list-style-type: none"> There is a knowledge but people do not know how to practice. 	<ul style="list-style-type: none"> There is data but superficial.
3 (51 - 70 %)	<ul style="list-style-type: none"> Doing what is supposed to do but need to put more effort. 	<ul style="list-style-type: none"> Understand and have overall knowledge. 	<ul style="list-style-type: none"> Sufficient data but not in order.
4 (71 - 90 %)	<ul style="list-style-type: none"> Almost ok, but not fully completed yet or insufficient. 	<ul style="list-style-type: none"> Almost ok, but in some are need further improve. 	<ul style="list-style-type: none"> Sufficient data and in order. Able to explain.
5 (91 - 100 %)	<ul style="list-style-type: none"> There is a proper evidence of 5S. 5S culture can be seen. 	<ul style="list-style-type: none"> Completely YES 	<ul style="list-style-type: none"> Orderly stratified data. Can show and answer immediately Visual Control is functional.

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	6							
EQUIPMENTS AND TOOLS	7	IN GOOD CONDITION AND BEING USED						
	8							
	9							

Self-Check 2	Written Test
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Instructions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers. Write your answers in the sheet provided in the next page.

1. What must be checked by top management? (3 points)
 2. Write three methods of patrolling? (3 points)
 3. What are the focal Points 5S auditors should examine? Write at least 6 of the focal points? (6 points)
 4. What the objective of sorting out non-compliance of 5S? (2 points)
 5. What is the responsibility of 5S audit committee do? (3 points)
 6. Write at least five techniques that help to sustain? (3 points)
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REFERENCE

- 5S for operators (1995)
- Ethiopian Kaizen Manual (2011)
- KAIZEN: The Key to Japan's Competitive Success (1986)
- Journals/publications/magazine



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