



Solar PV System Installation and Maintenance Level-II

Learning Guide-01

Unit of competence:-	Standardize and sustain 3S
Module Title:-	Standardizing and sustaining 3S
LG Code:	EIS PIM2 M16 LO1 LG-01
TTLM Code:	EIS PIM16TTLM 1019v1

LO 1: Prepare for work

Instruction Sheet 1	Learning Guide # 77
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Using work instructions.
- Reading and interpreting Job specifications.
- OHS requirements.
- Observing personal protection.
- Identifying and checking safety equipment and tools.
- Preparing and using tools and equipment

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Use work instructions.
- Read and interpret Job specifications.
- Observe OHS requirements.
- Observe personal protection.
- Identify and check safety equipment and tools.
- Prepare and use tools and equipment

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5 and Sheet 6 in pages 3, 12, 19, 21, 33 & 36 respectively.
4. Accomplish the Self-check 1, Self-check 2, Self-check 3, Self-check 4 Self-check 5 and Self-check 6 in pages 11, 18, 20, 32, 34 and 39 respectively
5. If you earned a satisfactory evaluation from the “Self-check” proceed to Operation Sheet 1 in page
6. Do the “LAP test” in page

Information Sheet-1	work instructions.
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1. Work Instruction

Information about the work

- Describe what workers need to be able to do on the job
 - ✓ Work functions
 - ✓ Key activities of each work function
 - ✓ Performance indicators
- Describe what task to be done or work roles in a certain occupation

Work instruction is a description of the specific tasks and activities within an organization. A work instruction in a business will generally outline all of the different jobs needed for the operation of the firm in great detail and is a key element to running a business smoothly.

In other words, it is a document containing detailed instructions that specify exactly what steps to follow to carry out an activity. It contains much more detail than a Procedure and is only created if very detailed instructions are needed. For example, describing precisely how a Request for Change record is created in the Change Management software support tool.

1.1. Procedures vs. Work Instructions

Many people confuse “procedures” with “work instructions”. In fact, most people write work instructions and call them procedures. Knowing the differences of procedures vs work instructions can help you understand the documentation process much better and, therefore, procedure documentation.

Procedures describe a process, while a work instruction describes how to perform the conversion itself. Process descriptions include details about the inputs, what conversion takes place (of inputs into outputs), the outputs, and the feedback necessary to ensure consistent results. The PDCA process approach (Plan, Do, Check, Act) is used to capture the relevant information.

Questions that need to be answered in a procedure include:

- Where do the inputs come from (suppliers)?
- Where do the outputs go (customers)?
- Who performs what action when (responsibilities)?
- How do you know when you have done it right (effectiveness criteria)?
- What feedback should be captured (metrics)?
- How do we communicate results (charts, graphs and reports)?

1.2. Job Requirements

A Job can be defined as:

- A piece of work, especially a specific task done as part of the routine of one's occupation or for an agreed price.
- a post of employment; full-time or part-time position
- Anything a person is expected or obliged to do, duty, responsibility
- An affair, matter, occurrence, or state of affairs
- The material, project, assignment, etc., being worked upon
- The process or requirements, details, etc., of working
- The execution or performance of a task

1.2.1. What are job requirements?

Job requirements are job qualifications and skills necessary for a certain position.

Job requirements are usually written in form of a list that contains most important job qualifications, skills and qualities that a candidate must possess in order to be able to perform certain job duties.

Job requirements are a crucial part of both job descriptions and job postings (job ads).

Job requirements are “must haves” that an employer is looking for in a candidate for a certain job position.

1.2.2. Important job requirements

Job requirements are equally important for both employers and job seekers. Their main goal is to let candidates know what is required of them before they apply.

- **For employers**

For an employer, job requirements are a way of preselecting potential candidates. They are used to communicate employer's expectations from job seekers.

By laying out clearly defined job requirements, employers can attract the right type of candidates. Over or under qualified candidates will be turned away from applying, thus saving employers a lot of time and money in the long run.

- **For job seekers**

For job seekers, job requirements are the crucial part of job postings (job ads). Job requirements section of the job ads should clearly state what an employer is looking for.

That way, potential candidates can know what is required of them before applying.

If they match all the job requirements criteria, it means they are a good fit for a job and they have a chance of actually getting it.

2. How-to-write-job-requirements

To write efficient job requirements, you should combine your job description with your candidate persona and choose the most important, key job qualifications and skills desired in your perfect candidate.

We'll start with the content, explain the best format for presenting job requirements, optimal length and introduce possible job requirements sections.

- **Content**

The golden rule for writing the content of your job requirements is very simple - it's KISS (Keep It Short and Simple).

Here are the 8 most important job requirements types:

- ✓ Work experience - types and amounts (years) of work experience
- ✓ Skills (soft skills and/or technical skills)
- ✓ Specific knowledge
- ✓ Education level and type
- ✓ Professional licenses, accreditations and certifications
- ✓ Personal qualities and attributes
- ✓ Languages
- ✓ Physical abilities.

Pick those types that are relevant for a specific job position you are looking to fill.

- **Format**

Avoid writing job requirements in a form of whole sentences to avoid overwhelming and scaring off potential candidates. The best practice is to write job requirements in a form of short, bullet-point listing.

- **Length**

Your job requirements should be shortest possible. Avoid writing the entire Wishlist of all your preferred skills and qualifications. The best practice is to list no more than 7 bullet points.

- **Sections**

If you absolutely must list more than 7 bullet points, the best practice is to split your job requirements paragraph into 2 separate sections.

In first you should list the absolute “must haves” for this job position, and in the second you can list your “nice to haves”.

You “must haves” should entail essential qualification to be considered for the job. However, if you also have the additional “nice to haves”, you will have an even better chance of getting it.

The basic requirements for a job remain the same no matter what the job is, where it is located or what professional and educational qualifications are required for it. These are as follows:

- ✓ **Discipline:** Nothing is possible without discipline.
- ✓ **Enthusiasm:** Enthusiasm for work is also a pre-requisite for any job.
- ✓ **Qualifications:** This is a more material, tactile need for a job which can be conveyed through degrees and certificates.
- ✓ **Soft Skills:** Soft skills include those skills which ensure that a job is executed well, and the employee can carry himself in the proper manner too.

Self- Check 1**Written Test****Direction I: Multiple choice questions**

Instruction: Choice the best answer from the given alternatives and write your answer on the answer sheet provided in the next page (2 point each)

1. Job requirements include :
 - A. Work experience
 - B. Specific knowledge
 - C. Education level and type
 - D. All of the above
2. One of the following is NOT true about a job
 - A. a piece of work
 - B. a post of employment
 - C. process or requirements
 - D. All of the above
 - E. None of the above
3. One of the following is basic requirements for a job
 - A. Discipline
 - B. Enthusiasm
 - C. Qualifications
 - D. Soft Skills
 - E. All of the above
4. It is a description of the specific tasks and activities within an organization
 - A. Job specification
 - B. Read and interpreter procedure
 - C. Work instruction
 - D. Job requirement

Note: Satisfactory rating – 4 and above points
points

Unsatisfactory - below 4

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

Answer key 1

1. D
2. E
3. E
4. C

Information Sheet- 2	Reading and interpreting Job specifications.
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2.1. Introduction

A successful operation in the hospitality industry requires efficient management of personnel and cooperation between many different skilled professionals. Working in this type of international setting can seem like a puzzle. To make it work, you must not only be familiar with the job specifications for your colleagues, but you must also be very familiar with your suppliers and customers. A job specification describes the knowledge, skills, education, abilities and experience that are essential to a particular job. In short, a job specification describes the exact person that a company requires for a particular role. A job specifications not identical to a job description. A job description defines the duties and requirements of an employee's job in detail, however most job specifications will include an overview of the duties included in the position.

2.2. Components of a Job Specification

- **Experience:** The number of years of experience you have had in the role in which you desire to fill. A job specification will detail the number of years of work experience a candidate needs in order to successfully fill a position. Positions that require more complex and responsible duties, and supervisory and managerial roles, will always require more work experience.
- **Education:** The training, degrees or certifications required for the position.
- **Required Skills, Knowledge and Characteristics:** This is where the employer states the skills, knowledge and characteristics of other employees who were previously in this position, or what the employer requires to fill the role. Characteristics refer to personality traits that the ideal candidate must possess. These might be patience or leadership, or good time management, flexibility or attention to detail.
- **Overview of Job Duties:** This is where the employer repeats the requirements and activities that the prospective employee must undertake in the position.

2.3. Read and interpret procedures

In any given industry, every workplace has standard procedures that all employees must adhere to. A procedure is a term used in a variety of industries to define a series of steps, taken together, to achieve a desired result. Procedures explain how to accomplish a task. A procedure is sometimes called a work instruction. There are procedures for most given scenarios in the workplace such as fire evacuation procedures, machine operation procedures or official procedures for filing a complaint.

Read the procedures below. Does your workplace have something similar?

Evacuation procedures in the event of a general evacuation:

1. Collect your valuables and prepare to leave
2. Make all equipment safe
3. Evacuate the room area in an orderly manner
4. move to designated assembly area by the nearest exit or as directed
5. ensure any disabled persons are assisted
6. remain at the assembly area to allow everyone to be accounted for
7. do not re-enter building until advised by the building warden, security or emergency services

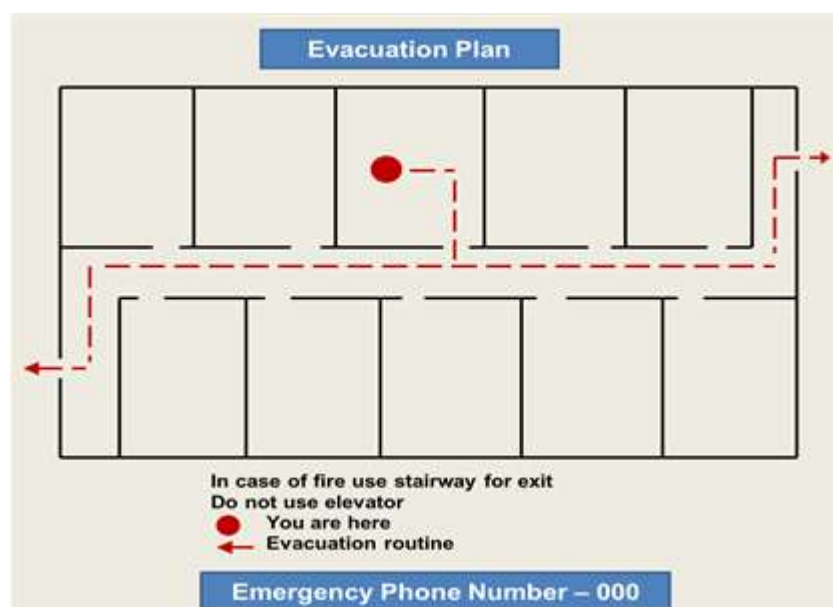


Figure 1: Evacuation plan

2.4. Read and interpret basic instructions, directions and/or diagrams

In every realm of employment there are instructions to follow, which are often placed within directions or diagrams. It is essential to know how to dissect, analyze and complete a given set of instructions in order to complete a given task. Often when you are in your own workplace, or even visit others, you will notice a variety of signs containing directions and diagrams all around you. This is often because of health and safety, and also because it is important for the customers and staff to follow the rules as exactly as they are presented. Many such signs contain pictures and diagrams in order to attract your attention and present information simply and clearly within picture format.



Figure 2 Basic instructions, directions and/or diagrams

Self- Check 2**Written Test****Direction I: Multiple choice questions**

Instruction: Choice the best answer from the given alternatives and write your answer on the answer sheet provided in the next page (2 point each)

1. One of the following is a component of job specification
 - A. Required Skills
 - B. Education
 - C. Experience:
 - D. All
2. Describes the knowledge, skills, education, abilities and experience that are essential to a particular job.
 - A. Job requirement
 - B. Job specification
 - C. Read and interpreter procedure
 - D. Work instruction
3. A job specification describes the exact person that a company requires for a particular role.
 - A. True
 - B. False
4. Which of the following is a component of a Job Specification?
 - A. Experience
 - B. Education
 - C. Required Skills, Knowledge and Characteristics
 - D. All

Note: Satisfactory rating – 2 and above points

Unsatisfactory - below 2 points

Answer Key2

1. A
2. B
3. A
4. D

Information Sheet 3	OHS requirement
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3.1 Definitions of Occupational Health and Safety(OHS)

"Occupational Health and Safety deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards."

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.

Health has been defined as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

Occupational health is a multidisciplinary field of healthcare concerned with enabling an individual to undertake their occupation, in the way that causes least harm to their health. For example, with the promotion of health and safety at work, which is concerned with preventing harm from any incidental hazards, arising in the workplace

Occupational health and safety are a planned system of working to prevent illness and injury where you work by recognizing and identifying hazards and risks.

The main focus in occupational health is on three different objectives:

- The maintenance and promotion of workers' health and working capacity;
- The improvement of working environment and work to become conducive to safety and health
- Development of work organizations and working cultures in a direction which supports health and safety at work and
- Promotes a positive social climate and smooth operation

3.2 OHS Requirements

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 includes 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.

3.3 Safety policies and procedures

A typical OHS policy includes procedures for the following:

- Emergency situation plan
- First aid plan
- Ground and venue checklist
- Handling chemicals checklist
- Induction processes for new staff, members and volunteers
- Risk identification for members and participants

From time to time Work Safe must make decisions about how it will interpret something that is referred to in legislation, or act on a particular issue, to ensure clarity. In these circumstances, Work Safe will develop a policy. A policy is a statement of what Work Safe understands something to mean, or what Work Safe will do in certain circumstances.

Health, safety, the environment and loss control in the workplace are everyone's responsibility.

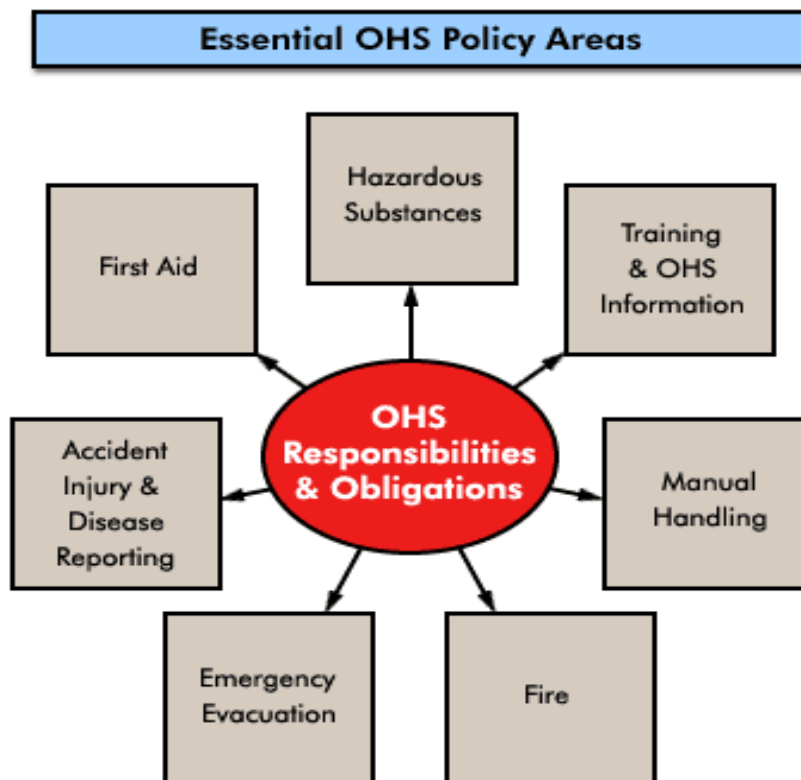


Figure 3 Essential OHS policy areas

Healthy and safety procedure is the responsibility of all people in the organization. A procedure sets out the steps to be followed for work activities. You must consult with affected workers when developing procedures for:

- resolving work health and safety issues
- consulting with workers on work health and safety
- monitoring workers' health and workplace conditions
- Providing information and training.

Procedures should be in writing to provide clarity and certainty at the workplace and demonstrate compliance. They should clearly set out the role of health and safety representatives, and any other parties involved in the activity. The procedures should be easily accessible, for example by placing them on noticeboards and intranet sites.

In the context of issue resolution where procedures are agreed to, the Work, Health and Safety Regulations 2011 include minimum requirements including that these procedures

are set out in writing and communicated to all workers to whom the procedure applies.

Many workplaces are required by law to have health and safety committees, which help develop standards, rules and procedures for health and safety that are to be followed or complied with at the workplace. According to the Work Health and Safety Regulations 2011, when it comes to risk management, a procedure is a form of 'administrative control' that means a method of work, a process or a procedure designed to minimize risk.

The Work Health and Safety Act (2011) states that while at work, a worker must co-operate with any reasonable policy or procedure of the person conducting the business or undertaking (PCBU) relating to health or safety at the workplace that has been notified to workers.

3.4 OHS Standards

The followings are standards of OHS:

- Identify the hazard
- Clear the area closed to the hazard
- Partition the hazard off or clearly identify the area to protect other people from harm
- If the hazard is easily and safely cleared, then do so



Self-Check -3	Written Test
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Direction I: TRUE or FALSE Questions

Instruction: Write TRUE if the statement is true or write FALSE (2 point each).

1. Health is a state of complete physical, mental and social well-being.
2. OHS requirements are NOT legislation/regulations/codes of practice and enterprise safety.
3. Identifying hazard is one of standards of OHS:.
4. Emergency situation plan cannot be as a typical OHS policy procedure.
5. Health, safety, the environment and loss control in the workplace are everyone's responsibility.

Note: Satisfactory rating –5 and above points

Unsatisfactory - below 5 points

Answer Key

1. TRUE
2. FALSE
3. TRUE
4. FALSE
5. TRUE

Information Sheet 4	Observing personal protection
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4.1. Observing personal protection

As an employer, you are in charge of a safe and healthy working environment for your employees. You are familiar with the safety risks within your sector, as well as the measures you can take to counteract these risks.

4.2. What is personal protective equipment (PPE)?

PPE means personal protective equipment or equipment you use to guarantee your (own) safety.

Use PPE always and anywhere where necessary. Observe the instructions for use, maintain them well and check regularly if they still offer sufficient protection.

4.3. Seven types of personal protective equipment (PPE)

Personal Protective Equipment includes protective clothing, gloves, footwear, helmets, goggles, respirators, aprons or other garments designed to protect workers from injury to the body by impacts, electrical hazards, heat and chemicals, and other job-related safety hazards.



Figure 4 PV installation safety tools

- **For the head safety**

Wearing a helmet offers protection and can prevent head injuries. Select a sturdy helmet that is adapted to the working conditions. These days you can find many elegant designs and you can choose extra options such as an adjustable interior harness and comfortable sweatbands.



Figure 5: Head Protection equipment

- **Eye and Face Protection**

The eyes are the most complex and fragile parts of our body. Each day, more than 600 people worldwide sustain eye injuries during their work.

Types of eye and face protection include:

- ✓ Safety glasses (required for most PV installation tasks)
- ✓ Goggles
- ✓ Face shields



Figure 6 Eye protection tools

- **Hearing protection**

Do you work in an environment with high sound levels? In that case it is very important to consider hearing protection. Earplugs are very comfortable, but earmuffs are convenient on the work floor as you can quickly put these on or take them off.



Ear muffs



Ear plugs



Ear caps

Figure 7: Hearing protection tools

- **Maintain a good respiration**

Wearing a mask at work is no luxury, definitely not when coming into contact with hazardous materials. 15% of the employees within the EU inhale vapours, smoke, powder or dust while performing their job. Dust masks offer protection against fine dust and other dangerous particles. If the materials are truly toxic, use a full-face mask. This adheres tightly to the face, to protect the nose and mouth against harmful pollution.



Dust mask



Half-face respirator



Full-face respirator

Figure 8: Respiratory protection tools

- **Hand protection**

Hands and fingers are often injured, so it is vital to protect them properly. Depending on the sector you work in, you can choose from gloves for different applications:

- ✓ protection against vibrations
- ✓ protection against cuts by sharp materials
- ✓ protection against cold or heat
- ✓ protection against bacteriological risks
- ✓ Protection against splashes from diluted chemicals.



Figure 9: Hand protection tools

- **Foot protection**

Even your feet need solid protection. Safety shoes (type Sb, S1, S2 or S3) and boots (type S4 or S5) are the ideal solution to protect the feet against heavy weights. An antiskid sole is useful when working in a damp environment, definitely if you know that 16,2% of all industrial accidents are caused by tripping or sliding. On slippery surfaces, such as snow and ice, shoe claws are recommended. Special socks can provide extra comfort.



Figure 10: Feet protection tools

4.4. Appropriate work closing

Preventing accidents is crucial in a crowded workshop. That is why a good visibility at work is a must: a high-visibility jacket and pants made of a strong fabric can help prevent accidents. Just like the hand protection, there are versions for different applications.



Figure 11: PV installation Work clothing

4.4.1. Fall Protection

- Falls are the leading cause of deaths in the construction industry
 - ✓ Most fatalities occur when employees fall from open-sided floors and through floor openings
 - ✓ Many PV arrays are installed on rooftops or elevated structures.
- Each employee on a walking/working surface with an unprotected side or edge 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.

4.4.1.1. Roofing Work and Fall Protection

- **Low-slope roofs (≤ 4 in 12 pitch)**
 - ✓ Each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling.
 - ✓ On roofs 50-feet or less in width, the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.

- ✓ Safety-monitoring system requires a competent person responsible for recognizing and warning employees of fall hazards.
- **Steep roofs (> 4 in 12 pitch)**
 - ✓ Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems

A warning line system is a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge.



Figure 12: warning line

Designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems.



a) Body Harnesses



b) Lanyard, Lifeline and Roof Anchors

Figure 13: Personal Fall Arrest Systems



- PV safety involves the safety of the workers installing the system and the safety of all others who may come in contact with the system after it is installed.
- OSHA regulations help keep workers safe.
- NEC requirements and AHJ inspections help ensure a safe system is installed.

Self-Check -4	Written Test
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Direction I: Multiple choice questions

Instruction: Choice the best answer from the given alternatives and write your answer
on the answer sheet provided in the next page (2 point each)

1. One of the following is OHS standard
 - A. Identify the hazard
 - B. Clear the area closed to the hazard
 - C. Partition the hazard off
 - D. All
2. Which one of the following PPEs ,protect the head from injury
 - A. Hard hat
 - B. Apron
 - C. Boot
 - D. Goggle
3. A typical OHS policy includes :
 - A. Emergency situation plan
 - B. First aid plan
 - C. Ground and venue checklist
 - D. All of the above
4. Which one of the following PPEs ,protect eyes from injuries
 - A. Hard hat
 - B. Apron
 - C. Boot
 - D. Goggle

Note: Satisfactory rating – 2 and above points Unsatisfactory - below 2 points

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

Answer Key:- 1.D 2. A 3.D 4.D

Information Sheet- 5**Identifying and checking Safety equipment and tools****5.1. Using Safety equipment and tools**

The use of PPE generally implies working in a potentially hazardous work environment and its use is a major means of injury prevention. Therefore, it is of prime importance to ensure that the equipment chosen is both reliable and effective, it is being properly used and maintained, and the user has undergone adequate training.

PPE should fit properly, snug but not tight or loose, and it should not impede movement or communication. Select the right PPE for the task. Do not wear PPE that could potentially cause injury, such as loose-fitting gloves that could be caught in moving parts of equipment or machinery. For loose fitting gloves, tape or fold a cuff on the gloves to prevent chemicals from running down the user's arm.

Do not wear PPE outside of laboratory or shop areas to prevent spreading contamination to other areas.

Employees must be trained in how to don and doff PPE and the limitations of the PPE for the specific procedure. Workers need to handle PPE safely when removing it from the body to avoid contaminating themselves and surfaces nearby. Disposable gloves, sleeves, shoe covers and Tyvek clothing and potentially contaminated PPE such as aprons, lab coats and other items need to be removed so that any contamination is not exposed. Disposable items should be peeled off turning them inside out as they are removed. Reusable gloves, aprons and other potentially contaminated items should be rinsed off before removing them, and then peeled off or folded so that the contaminated surface is inside.

5.2. Key Points on the Proper Use of Personal Protective Equipment**a. Proper selection**

You must first understand the nature and degree of the potential hazards, and then select appropriate PPE that meets the relevant standards. Furthermore, some PPE (such as breathing apparatus) must properly fit the physique of the user before they can be effective. PPE must meet the demands of the work environment and should be as comfortable and easy to use as possible.

b. Correct use

You must fully understand and abide by the correct usage methods of the PPE. Examples of incorrect use include different brands of filter being fitted to a respirator or the filters being cleaned with water.

c. Correct maintenance

PPE should be cleaned and dried after use, properly stored and regularly inspected. If you Discover any damage to the PPE; you should immediately report this to your supervisor so That it can be replaced.

- ✓ Inspect PPE before and after each use.
- ✓ Take care of PPE at all times.
- ✓ Clean all PPE after use.
- ✓ Repair or replace damaged or broken PPE.
- ✓ Store PPE in clean dry air - free from exposure to sunlight or contaminants.

Self-Check -5**Written Test****Direction I: Multiple choice questions**

Instruction: Choice the best answer from the given alternatives and write your answer on the answer sheet provided in the next page (2 point each)

1. The requirement to use PPE properly
 - A. Proper selection
 - B. Correct use
 - C. Correct maintenance
 - D. All of the above
2. Which one of the followings is NOT Correct maintenance activity?
 - A. Inspect PPE before and after each use.
 - B. . Store PPE in clean dry air
 - C. Clean all PPE after use.
 - D. None of the above
3. Appropriate PPE is selected based on the nature and degree of the potential hazards,
 - A. True
 - B. False

Note: Satisfactory rating – 2 and above points Unsatisfactory - below 2 points.

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

Answer Key

1. D 2. D 3. A

Information Sheet- 6	Preparing and using tools and equipment to implement 3S
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6.1 Introduction to 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 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.

To understand and successfully implement Kaizen the following Kaizen requisites should be fulfilled.

- Knowledge of Kaizen concepts and techniques is essential for doing Kaizen activities. Kaizen is easy to understand and should be started from the easy Kaizen techniques such as 5S and QC7 tools.
- Attitude with positive thinking is necessary for understanding and implementing Kaizen and Kaizen concept and techniques can also build positive attitude and can bring corporate culture.
- Involvement of all from top management to front-line workers: top management with commitment and interest on Kaizen, participation of all workers and establishment and involvement of cross-functional teams are essential for success and continuity of Kaizen.
- Zealous support for Kaizen: Kaizen needs zealous attention like support for one football team.
- Education about Kaizen (training): Kaizen is human-oriented i.e. it is implemented by employees therefore education or training about Kaizen is vital.

- Never-ending activity: Kaizen is continuous and practical, aiming always for best improvement through accumulation of small improvements.

6.2 Identifying elements of Kaizen

Improvement/change for the better and ongoing/continuity are the two elements that construct Kaizen. Absence of one of the elements would not be Kaizen.

The key elements of Kaizen are:

- Quality
- Effort
- Involvement of all employees
- Willingness to change and
- Communication

There are also five foundation elements of Kaizen:

- Teamwork
- Personal discipline
- Improved moral
- Quality circles and
- Suggestions for improvement

6.3 Identifying ways to improve Kaizen elements

Kaizen is the ongoing, systematic, incremental improvement in the way things are done. It is a relentless attempt to eliminate the unnecessary activities, delay, waste, and variation of business processes that add cost without adding value. Kaizen results in improved lead-time, efficiency, quality, productivity and customer loyalty.

"The goals of continuous improvement are simple: 1) make things easier 2) better 3) faster and 4) cheaper". It is the new "best solution"—from the customer's point of view (five customer types).

Below are ways to help the philosophy of Kaizen—Continuous Improvement—take hold in your organization.

- **Involve Everyone** – Kaizen is a strategy that involves every employee, from management to the cleaning crew.
- **Challenge the Status Quo** – Throw out all your old fixed ideas on how to do things. Avoid the emotional traps of blaming people or making excuses that prevent you from discovering the real problem. Once you have established the new best-way of doing something, stick with it until a better way is found.
- **Get Specific** –Asking “why” until you get to the root cause of the problem. Improve specific steps or components in your business systems and processes; there is no other way! Get defects to less than 1%.
- **Start with yourself** –Get connected with your numbers (leading and lagging indicators), and with customer, employee, and vendor feedback. Read skill-based business books and articles. Seek ways to improve your own personal performance, and encourage those around you to do the same.
- **Keep It Simple and Inexpensive** – Ideas for incremental improvements that bubble up from workers are usually easier to implement and less expensive. Follow the 80-20 Rule; do the twenty-percent of things that get you eighty-percent of improvement results. And do it NOW! Don’t wait until you can achieve perfection.
- **Focus on the Right Things** – Improve the core business systems that enable you to find and keep customers, and earn more money. Find ways to provide customers greater value and a better buying experience. Remember: quality plus speed equals low cost.
- **Provide Training** – Kaizen involves setting performance standards for your business systems and processes and then striving to elevate those standards. Continuous Improvement requires ongoing development of your most important asset.
- **Look for Breakthroughs** – Up to this point, we have focused on small incremental changes. However, Kaizen will sometimes produce breakthrough improvements.
- **Never Stop Improving** – Halt the process immediately to fix quality or customer-related problems. Don’t let problems accumulate for later handling. Reflect daily

on your opportunities for improvement and innovation. Just one improvement a day is 365 improvements a year!

Kaizen (*Continuous Improvement*)

5 Principles



Figure 14: Five principles of continuous improvement

6.4 Understanding benefits of improving Kaizen elements

Kaizen aims for improvements in productivity, effectiveness, safety, and waste reduction, and those who follow the approach often find a whole lot more in return:

- Less waste – inventory is used more efficiently as are employee skills.
- People are more satisfied – they have a direct impact on the way things are done.
- Improved commitment – team members have more of a stake in their job and are more inclined to commit to doing a good job.
- Improved retention – satisfied and engaged people are more likely to stay.
- Improved competitiveness – increases in efficiency tend to contribute to lower costs and higher quality products.
- Improved consumer satisfaction – coming from higher quality products with fewer faults.
- Improved problem solving – looking at processes from a solutions perspective allows employees to solve problems continuously.

- Improved teams – working together to solve problems helps build and strengthen existing teams.

6.5 Understanding the fourth pillar of 5S

5S is a method of creating a self-sustaining culture which perpetuates a neat, clean, efficient workplace; a method for removing all excess materials and tools from the workplace and organizing the required items such that they are easy to find, use, and maintain.

The five steps of Japanese 5S are:

- **Sort (Seiri)**
No unnecessary items at the workplace: “When in doubt, throw it out!”
- **Set in Order (Seiton)**
Anyone can instantly find, take, and return any needed item: “A place for everything, and everything in its place”
- **Shine (Seiso)**
Deviations become visual by cleaning: “Cleaning = inspection; Cleaning with meaning”
- **Standardize (Seiketsu)**
Visualize the 5S standards in the workplace: “Make the best way the easiest way”
- **Sustain (Shitsuke)**
Everybody follows the standard until we have a better one: “Stick to it!”

6.6 Kaizen Board

This board is the main source of information regarding Kaizen and the actual status of improvement and activities leading to further improvements. For every working group or team such a board has to be developed and kept up to date. A team has to focus on how they can contribute to the company’s overall set of targets. As long as the team is able to transform their ideas and small problems into solution, they should do this immediately without asking for help from outside the team. This is real KAIZEN!!! Only if a problem is too big, too much money needed or other departments or experts needed for realizing a solution, the team has to transfer the idea/problem (a reason how a solution contributes to improvement should be part) to the next higher hierarchy level.

As soon as every small unit or team is with such a Kaizen board, it’s easy for the whole management to be informed at any time, just be walking around and check the

information given on the Kaizen boards. Make sure that the reached improvement level will stay in future.

The information on the board is divided into four corners:

- The “**Staff performance record corner**” shows the actual staff performance as well as the gaps and need of training.
- The “**Improvement/success corner**” shows the actual status of the three to five most important improvement targets for this team. Additional you can put samples of success (picture of best performer from this team, letter of thanks from the GM...)
- The “**Idea/problem corner**” is the place where every team member is expected to place his ideas or small problems
- The “**Solution corner**” covers the solution actually developing by the team

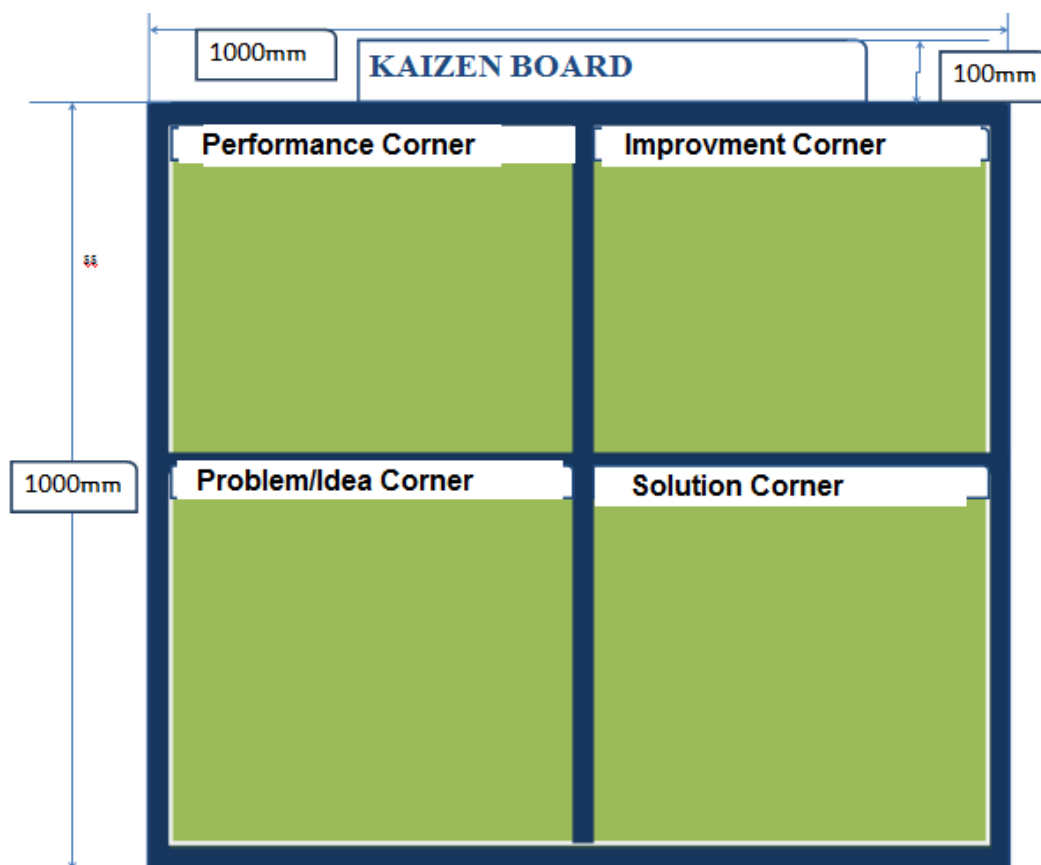


Figure 15: Kaizen Board

6.6.1. Rules for using the board:

The staff performance is visible by three different colours red = newcomer; blue = average performer with space of improvement; green = best performer able to do his process step independent without outside help). The improvement graphs have to be updated on a weekly basis. AS soon as the result is below the target, the team has to search for a reason why and find an idea or solution for improvement. Everybody from the team is invited to put his ideas on the board! After maximum one week time, the idea/problem should be transferred into a solution! So the Idea paper has to go to the solution corner. After another week, small solutions have to be put into reality! Bigger solutions/problems have to be sent to the next hierarchy level for realisation.

6.7 Analyzing and preparing shop layout of the workplace

Layout planning is deciding on the best physical arrangement of all resources that consume space within a facility. These resources might include a desk, a work center, a cabinet, a person, an entire office, or even a department. Decisions about the arrangement of resources in a business are not made only when a new facility is being designed; they are made any time there is a change in the arrangement of resources, such as a new worker being added, a machine being moved, or a change in procedure being implemented. Also, layout planning is performed any time there is an expansion in the facility or a space reduction.

The arrangement of resources in a facility can significantly affect the productivity of a business. A lot of wasted time, energy, and confusion can result from a poor layout. There are also other reasons layout planning is important. In many work environments, such as office settings, face-to-face interaction between workers is important.

Proper layout planning can be critical in building good working relationships, increasing the flow of information, and Improving communication, similarly, in retail organizations layout can affect sales by promoting visibility of key items and contributing to customer satisfaction and convenience. Layout planning affects many areas of a business, and its importance should not be underestimated.

There are two general objectives which layout planners should seek to meet through careful organization of the site for construction:

- First, the site must be designed to maximize efficiency of operations in order to promote worker productivity, to shorten project time and to reduce cost.
- Second, the final plan must create a project with a good work environment in order to attract and retain the best personnel and thus contribute to better work quality and productivity.
- The following are items to consider:
 - ✓ Flooring
 - ✓ Building framework
 - ✓ Building height
 - ✓ Roof trusses
 - ✓ Building cladding
 - ✓ Material storage
 - ✓ Access
 - ✓ Movement
 - ✓ Machinery and equipment
 - ✓ Covered space
- In the absence of a precise work shop layout plan, the following problems may occur:
 - ✓ Material stacks wrongly located
 - ✓ Plant and equipment wrongly located
 - ✓ Inadequate space allowed
 - ✓ Site huts wrongly located in relation to their effective use

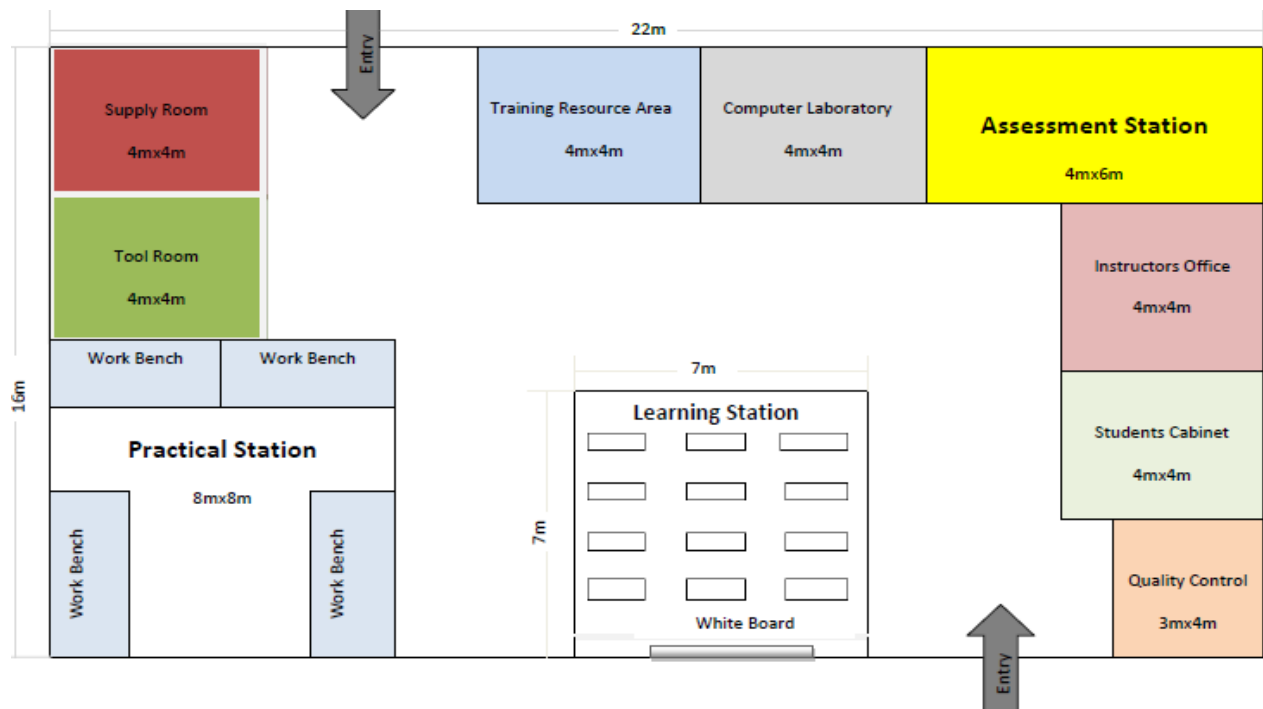


Figure 16: Sample Layout of OBT work shop

6.8 Tools and Equipment used to implement 3S

You are required to prepare and use tools and equipment to implement sort, set in order and shine activities in to your work station. The following are some tools and equipment that help you in the implementation of 3S.

6.9 Tools and materials used to implement Sort activity

Tools and materials are required to implement sort, set in order and shine activities in work stations. The following are some tools and materials used to implement the first pillar of 5S-Sort.

- red tags
- hook
- shelves
- sponge
- pencil
- Digital multimeter
- Clamp-On meter
- sticker
- nails
- chip wood
- broom
- shadow board/ tools board

6.10 Tools and materials used to implement set in order

The following are some tools and materials used to implement the second pillar of 5S-Set in order.

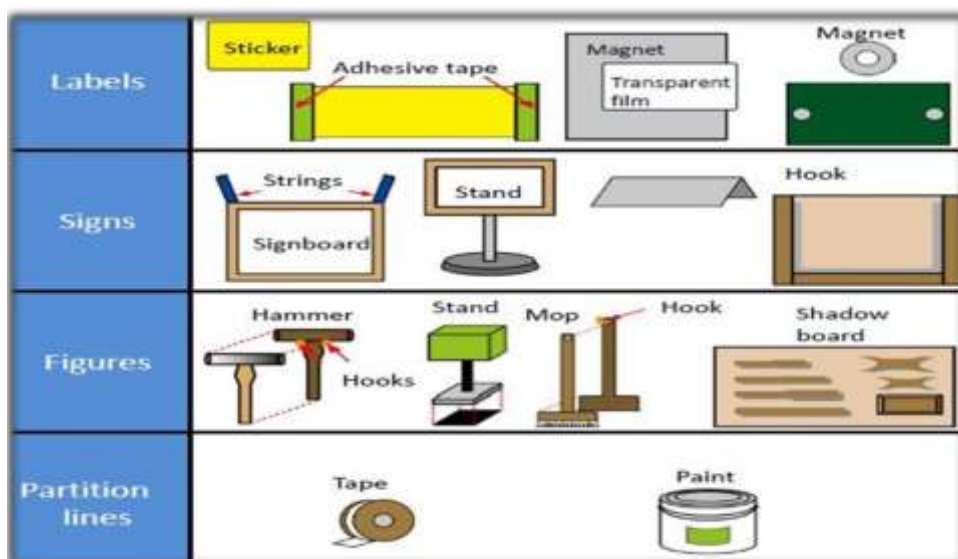


Figure 17: Tools and materials used to implement set in order

6.11 Tools and materials used to implement shine

The following are some tools and materials used to implement the third pillar of **5S-Shine**.

- Sponges
- Brooms
- Brushes
- Spades
- Vacuum cleaners
 - Electric blower
- Waste baskets
- Dust bins
- Gloves
- Dust masks
- Detergents
- Containers
- Oils
- Bolts
- Screws
- boots shoes
- Mop



Figure 18 : Tools and materials used to implement shine

Self-Check -6

Written Test

Direction I: Multiple choice questions

Instruction: Choice the best answer from the given alternatives and write your answer on the answer sheet provided in the next page (2 points each)

1. One of the following is key element of kaizen

- | | |
|--------------|------------------------|
| A. Team work | C. Personal discipline |
| B. Quality | D. Improved moral |

2. One of the following is foundation elements of Kaizen

- | | |
|--------------|--------------------------|
| A. Team work | C. Effort |
| B. Quality | D. Willingness to change |

3. It is the 4th pillar of 5S

- | | |
|-----------------|----------------|
| A. Sort | C. Standardize |
| B. Set in order | D. Shine |

4. One of the following is benefits of improving Kaizen elements

- | | |
|------------------------------|-----------------------------|
| A. People are more satisfied | C. Improved problem solving |
| B. Improved commitment | D. AI |

5. Which of the followings is NOT included in Kaizen Board

- | | |
|-----------------------|------------------------|
| A. Performance corner | C. Solution corner |
| B. Assessment corner | D. Problem/Idea corner |

6. One of the following is a tool and material used to implement shine

- | | |
|-----------|----------|
| A. Sponge | C. Brush |
| B. Brooms | D. All |

7. One of the following is a tool and material used to implement sort

- | | |
|-----------|----------|
| A. Shelve | B. Spade |
|-----------|----------|



- C. Wheelbarrow
D. Detergent
8. One of the following is a tool and material used to implement set in order
- A. Partition line
C. Label
B. Sign
D. all

Note: Satisfactory rating – 4 and above points Unsatisfactory – below 4 points

You can ask you trainer for the copy of the correct answer

Answer Key

1. B 2. A 3. C 4. D 5. B 6. D 7. D 8.D

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

LAP Test**Practical Demonstration**

Name: ----- Time started: -----

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks within 1 hour.

Task 1: identify and prepare tools and techniques to the sort activities.

Task 2: identify and prepare tools and techniques to the set in order activities.

Task 3: identify and prepare tools and techniques to the shine activities.

Task 4: using the identified, prepared and given tools and techniques perform 3S to your/ the given work area.

- identify the:
 - person -in-charge
 - technology workshop
 - work station
- consider the:
 - OHS procedures
 - workplace procedures and standards (work area)
 - frequency of maintenance activities

List of Reference Materials

- 5S for operators (1995)
- www.kaizen-institute.com
- Barnes, T., "Kaizen strategies for successful leadership", 1996, Pitman Publishing, London
- www.leankaizen.co.uk



Solar PV System Installation and Maintenance

Level-II

Learning Guide-02

Unit of competence:-	Standardize and sustain 3S
Module Title:-	Standardizing and sustaining 3S
LG Code:	EIS PIM2 M16 LO2 LG-02
TTLM Code:	EIS PIM2 TTLM 1019v1

LO 2: Standardize 3S.

Instruction Sheet	Learning Guide #78
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Preparing and using plan. to standardize 3S .
- Relevant procedures in standardizing 3s
- Preparing and implementing tools and technique
- Following Checklists for standardize activities
- Reporting to relevant personnel
- Keeping the workplace to the standard.
- Avoiding problems.

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

- Prepare and use plan. to standardize 3S .
- Relevant procedures in standardize 3s
- Prepare and implement tools and technique
- Follow Checklists for standardize activities
- Report to relevant personnel
- Keep the workplace to the standard.
- Avoid problems.

Learning Instructions

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information Sheet 1, Sheet 2, Sheet 3, Sheet 4, and Sheet 5 in pages 43, 47, 59, 67 and 72, respectively.
4. Accomplish the Self-check 1, Self-check 2, Self-check 3, Self-check 4 and Self-check 5 Self- in pages 46, 58, 66, 71, and 74 respectively



5. If you earned a satisfactory evaluation from the “Self-check” proceed to Operation Sheet 1 in page 75.
6. Do the “LAP test” in page 76.

Information Sheet-1**Preparing and using plan to standardize 3S activities****1.1. Introduction to standardize**

Standardization is one of the tools that can be applied in the continuous improvement of the organization. Standardized work is one of the most powerful but least used lean tools. By documenting the current best practice, standardized work forms the baseline for kaizen or continuous improvement. As the standard is improved, the new standard becomes the baseline for further improvements, and so on. Improving standardized work is a never-ending process. It reduces the variations of the process and improves the quality of products and processes. In this contribution standardize is described 5S method, which is used in the solar PV installation to eliminate, respectively elimination of waste in the workplace through five steps.

The high standard of solar PV installation can be ensured by standardization. To develop the standards employees play a great role in it. Every installer knows his responsibilities and housekeeping duties are performed in a regular routine. Best work practices are carried out and different ways are found out to ensure that every one carries out their individual activity in their workplace.

Standardization is the way in which businesses can reduce their costs (whether financial or time). It is the way an organization which aims to ensure clear, visualized and safe working environment. With proper implementation of standards prevents defects in production and at the same time constitute procedures to prevent the occurrence of other errors that could have an impact on production. It is therefore desirable to standardize all activities carried out in the PV installation process.

The standardization process is considered the basis for continuous improvement (Kaizen). Improving standardized work is a never ending process.

The standards define best practices for the implementation of installation work. The aim is to do the job right the first time without error, without negative effects on humans

and the surroundings. If you improve the standard, the new standard becomes the basis for further improvement.

1.2 Benefits of standardizing 3S

The benefits of standardized work include documentation of the current process for all shifts, reductions in variability, easier training of new operators, reductions in injuries and strain, and a baseline for improvement activities. Standardizing the work adds discipline to the culture, an element that is frequently neglected but essential for lean to take root.

The benefits are:-

- Lead to workplace standardization
 - ✓ prevent setbacks in the first three pillars
 - ✓ Make implementing them a daily habit
 - ✓ Ensure that all the three pillars are maintained in their fully implemented state
- Lead to work standardization
 - ✓ Muda elimination
 - ✓ Quality improvements
 - ✓ Cost improvements
 - ✓ Delivery time improvements
 - ✓ Process improvements
- improved safety,
- facilitate communication, ,
- assistance in training and education,
- increasing labor discipline,
- facilitating the response to the challenges,
- Clarification of the working procedures.
- Sizes and dimensions are co-ordinated and adapted
- Variety is reduced
- Function requirements and characteristics are specified
- Unambiguous testing methods are established
- Easier to implement tanning.



- Less room for errors and scrap
- Work area is more organized
- Work area is safer



Self-Check -1	Written Test
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Direction I: Multiple choice questions

Instruction: Choice the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

- Benefit of standardize in 3S to workplace
 - Improve Quality
 - Eliminate muda
 - prevent setbacks in the first three pillars
 - all of the above
- One of the following is not Benefit of standardize
 - Clarification of the working procedures
 - increasing labor discipline
 - facilitating the response to the challenges
 - none
- Standardize is simply the result of doing the first three steps properly – namely sort, set in order, and shine.
 - True
 - False
- It is the 4th pillar of 5S
 - Sort
 - Set in order
 - Standardize
 - Sustain

Note: Satisfactory rating – 2 and above points , Unsatisfactory - below 2 points

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

Answer Key

- D
- D
- A
- C

Answer Sheet-1

Name: _____

Date: _____

Score = _____

Rating: _____

Information Sheet-2	Relevant procedures in standardizing 3s
----------------------------	------------------------------------------------

2.1. How to Implement Standardize

The three steps to making Sort, Set in Order and Shine activities (the three pillars or 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.

2.2. Common Tools and Techniques to standardize 3S

The tools and techniques used to standardize 3S are:-

- 5S Job Cycle Charts
- Visual 5S
- the Five Minute 5S
- Standardization level checklist
- 5S checklist
- The five Whys and one How approach(5W1H)
- Suspension
- Incorporation
- Use Elimination

2.3. 5S Job Cycle Charts

5S job cycle charts, which list the 5S jobs to be done in each area, and set frequency cycle for each job (see the figure below). In the example shown in the figure below, 5S duties are sorted out according to the first three pillars and the scheduling cycle. In the figure, code letters are used for the various cycle periods:

A is for 'continuously,' B for "daily (mornings)," C for "daily (evenings)," D for "weekly," E for "monthly" and F for "occasionally." Each 5S job assignee can then use

these charts as 5S Checklists. This particular example shows clearly who is responsible for each job, which area, what to do, and when to do it.

Table 1: 5S Job Cycle Chart

5S Job Cycle Chart		Div./Dept./Section		Prod. Div.			JOB CYCLE					
		Entered by:		Date:								
No.	5 S Job	Sort	Set in order	Shine	Standardize	Sustain	A	B	C	D	E	F
1	Red-tag strategy (occasional, companywide)	O									O	
2	Red-tag strategy (repeated)	O					O					
3	Place indicators (check or make)		O						O			
4	Item indicators (check or make)		O						O			
5	Amount indicators (check or make)		O						O			
6	Sweep around line			O				O				
7	Sweep within line			O				O				
8	Sweep around worktable			O				O				
9	Sweep on and under worktable			O				O				
10	Sweep work areas and walkways			O					O			

A job cycle code

- A. Is continuously
- B. Is daily (mornings)
- C. Is daily(evening)
- D. Is weekly
- E. Is monthly
- F. Is occasionally

2.4. Visual 5S

The Visual 5S approach makes the level of five pillar conditions obvious at a glance. This is particularly helpful in PV installation that handle a great variety and number of materials.

The main point of Visual 5S is that anyone should be able to distinguish between abnormal and normal conditions at a glance.

As a PV installation example, consider a drill-press process where Set in order has been applied so that the position and amount of each finished work piece is clearly indicated.

As an additional visual aid, the place where the last batch item goes can be marked with a thick red line to indicate that it is time to stop and send the batch to the next process.

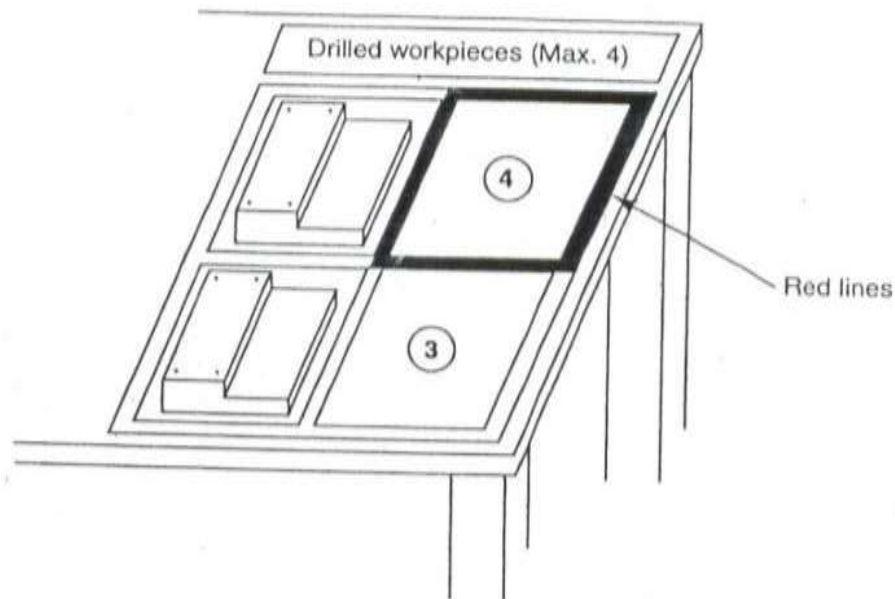


Figure 19: visual 5S method for indicating maximum batch size

2.5. The Five Minute 5S

When using the Visual 5S approach, instant visibility can act as a trigger for taking immediate three pillar action (Sort, Set in Order, and Shine activities) against the discovered abnormalities (i.e., overproduction, disorder, and contamination). We must also deal with the question of how skillfully and efficiently these actions are carried out. 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. 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. In figure below shows a signboard that was made as part of a Five-Minute 5S campaign.

Five Minutes 5SCampaign	
Today's Five Minute 5S Work	
Tuesday	
Time 8:30 to 8:35	Person in charge Abebe
1 S Sort	Storage Site for unprocessed items (Red -Tag unneeded item)
2 S set in order	Storage Site for unprocessed items (Make divider lines & distribute workload)
3S shine	Pneumatic three point setting (Cleanout interior dirt)
4S Standardize	Oil leaks (find one !!)
5S Sustain	(Pause, point, and call)

Figure 20: Five-Minute 5s Signboard

2.6. Standardization level checklist

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			Dept.: Assembly Dept. 1	Feb. 15, 1994	
			Assigned area	Entered by: McCarthy	Page
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 3 4 5	1 2 3 4 5	1 2 3 4 5	50

Figure 21: standardization level checklist

2.7. The five Whys and one how approach (5W1H)

We begin by asking "why?" until we identify the underlying causes- for every answer we solidify we must ask "why" again. Usually we ask "why" at least five times to get to the root of the problem. When we do find the underlying cause, we ask "how" we call fix it. Accordingly, this method is called the "5W1H" approach.

Table 2: 5W1H

5W1H	Description
Why?	Necessity of the standardized activity
Who?	In-charge of the standardized activity
When?	Period / Frequency of implementation of the standardized activity
Where?	Place at where the standardized activity is taken place
What?	Objectives of the implementation (verbs) or tools used for the standardized activity
How?	Methodology to carry out the standardized activity (verbs)

When we ask "why" setting in order is breakable, we find that one answer is because people make mistakes putting things back. At this point, we need to identify what types of items are not being returned correctly. Once we identify this, the question is how to achieve unbreakable setting in order by making it impossible to return them to the wrong place. If we can somehow eliminate the need to return items at all, we can achieve unbreakable setting in order.

Three techniques for doing this are:

- Suspension
- Incorporation
- Use elimination.

a. Suspension:-In the Suspension technique, tools are literally suspended from above, just within reach of the user. Figure above shows this method in practice. Here a weighted pulley device is used to suspend tools from an overhead rack. When the operator finishes using the tool, he merely releases it and it automatically returns to its proper storage place.

While this technique does not eliminate the need to return items to a specific place, it does effectively eliminate the need for people to return them. People may make mistakes in returning things, but suspension devices do not. This technique achieves



Figure 22 : Tools Suspended from an Overhead Rack

b. Incorporation:-means creating a flow of goods or operations in a factory process in which

(1) jigs, tools, and measuring instruments are smoothly integrated into the process and

(2) Such devices are stored where they are used and therefore do not have to be returned after use. The figure below shows an example where a measuring gate has been incorporated into a cutting process for an automobile part. The measuring gate catches any pieces that have not been machined to the correct height. This measuring procedure is an example of "mistake-proofing" (or poka- yoke). The incorporation of the measuring gate into the cutting process means that its storage place is also its place of use. It is therefore used (for full-lot inspection)

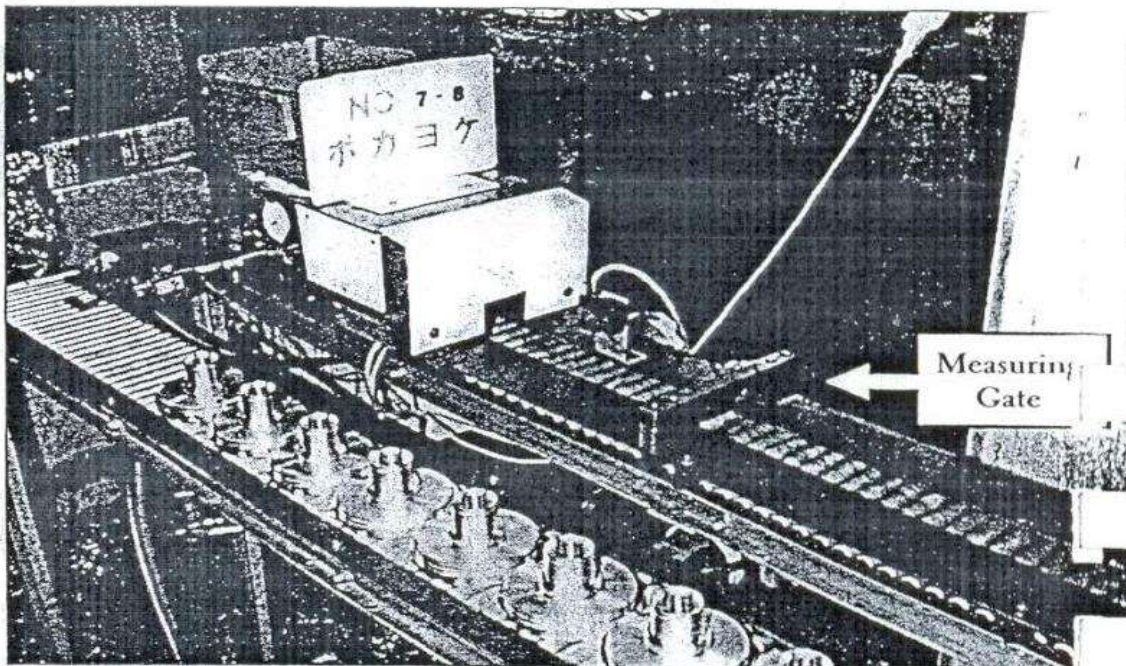


Figure 23: Incorporating a Measuring Gate into the Process Flow

C. Use elimination Suspending or incorporating jigs, tools, or measuring instruments effectively eliminates the need to return them after each use. However, these items are still being used. The question is whether there is some way to serve the function of the tool without using the jig, tool or measuring instrument. A set in order approach that eliminates the use of a particular jig, tool or measuring instrument is in fact unbreakable setting in order.

There are three techniques for eliminating the use of certain tools:

- Tool unification
- Tool substitution
- Method substitution

Tool unification means combining the functions of two or more tools into a single tool. It is an approach that usually reaches back to the design stage. For example, we can reduce the variety of die designs to unify dies or make all fasteners that require a screw-driver conform to the same kind of screw-driver, flat-tip or Phillips.

Tool substitution means using something other than a tool to serve the tool's function, thereby eliminating the tool. For example, it is sometimes possible to replace wrench-turned bolt with hand-turned butterfly-grip bolts, thereby eliminating the need for a wrench.

Method of substitution: -If we substitute ordinary wrench-turned bolts with hand-turned butterfly-grip bolts, we have eliminated the wrench, but we have not eliminated the method (bolt fastening). Bolt fastening is just one way to fasten things. Fastening pins, clamps and cylinders can also be used for this purpose. We may find we can improve efficiency even more by replacing one method with another. This is "method substitution Standards for Location Indicators

Fixed position Indication



Figure 24 : fixed position indications

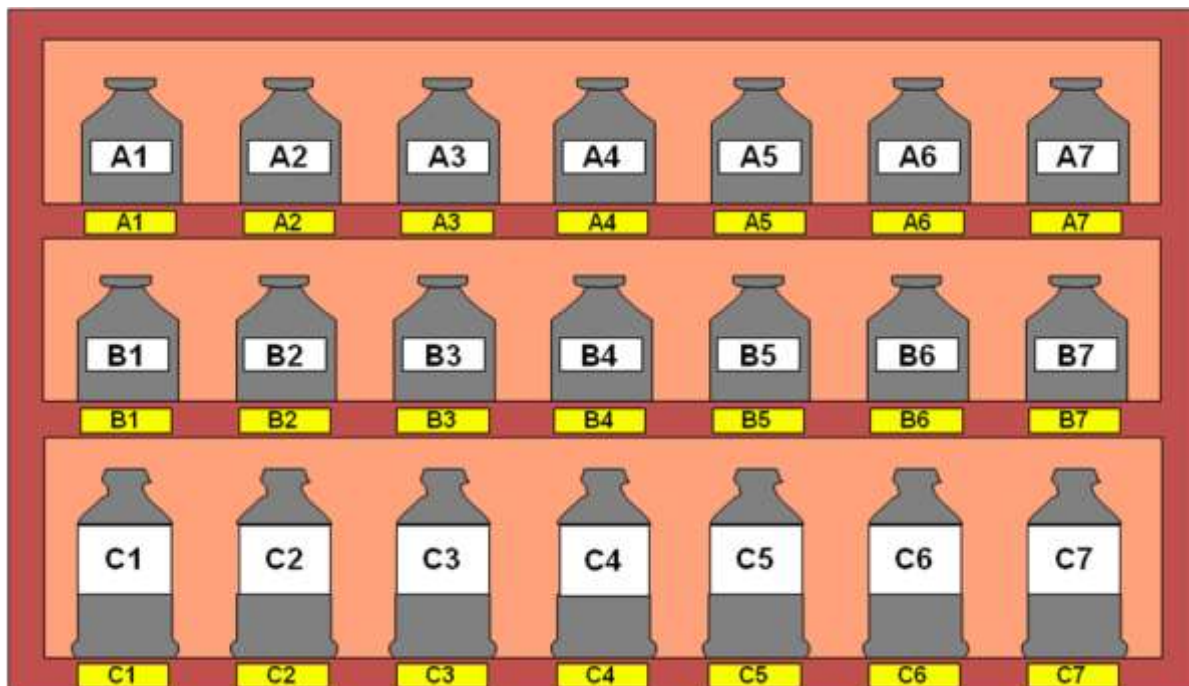


Figure 25: Indications on Shelves

standards of pathways on premise (examples)

	Standards
Width of walkway	80 cm or more
Width of main pathway	1.2 m or more
Color of partition line	Yellow or white
Material for partition	Tape or paint

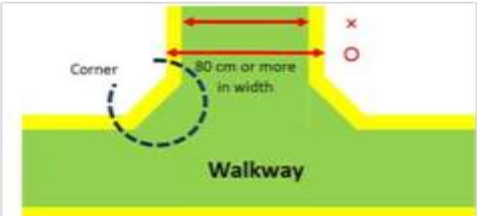



Figure 26: pathway indicator

Self-Check -2	Written Test
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Direction I: Multiple choice questions

Instruction: Choose the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

1. One of the following is a tool and technique used to standardize 3S
 - A. 5S Job Cycle Charts
 - B. Visual 5S
 - C. The Five Minute 5S
 - D. All
2. Which one of the following approaches is used when instant visibility can act as a trigger for taking immediate three applications.
 - A. Five minute 5S
 - B. Visual 5S
 - C. Job cycle chart
 - D. Suspension
3. Process of combining the function of two or more tools in to a system tool is known as:
 - A. Tool reducing
 - B. Tool substitution
 - C. Tool unification
 - D. Tool repairing

Note: Satisfactory rating - 2 points and above Unsatisfactory - below 2 points

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

Answer Key

1. A
2. A
3. C

Information Sheet-3**Tools and Techniques to Standardize 3S****3.1. Relevant procedure to standardize 3S**

Relevant procedures to standardize 3S are:-

- Assign 3S responsibilities
- Integrate 3S duties into regular work duties
- Check on 3S maintenance level
- OHS measures such as signage, symbols / coding and labeling of workplace and equipment
- Creating conditions to sustain your plans
- Roles in implementation

3.2. Assign 3S Responsibilities

When it comes to maintaining three pillar conditions, everyone must know exactly what they are responsible for doing and exactly when, where and how to do it. If people are not given clear 3S job assignments based on their own workplaces, the Sort, Set in Order, and Shine activities will not have much meaning. Similarly, clear

3S instructions must be given to the people who deliver goods from outside suppliers. The delivery sites should be clearly marked and a 5S Map posted to show where each supplier's goods are to be unloaded. At each unloading site, signboards should make it clear whose things go where and in what amount. The suppliers should be made responsible for maintaining 3S conditions at their own unloading sites and encouraged to join in full 5S implementation.

Tools for assigning 3S responsibilities include:

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



3.3. Integrate 3S Duties into Regular Work Duties

If people carry out three pillar maintenance duties only when they see three pillar conditions slipping, then the five pillar implementation has not yet taken root. Maintenance must become a natural part of everyone's regular work duties. In other words, the five pillars -centered on maintaining 3S conditions-must be part of the normal work flow. We sometimes refer to this as "5S line integration" or establishing a five pillars flow. Visual 5S and Five-Minute 5S are two approaches that help make maintenance work part of the everyday work routine.

3.4. Check on 3S maintenance level

Even After we have assigned 3S jobs and have incorporate 3S maintenance into everyday work routine, we still need to evaluate how well the 3S are being maintained. For this, we can set up a 5Spatrol. These 5S patrols are similar to the QC patrols used in the quality control movement, except that the 5S focus is more specific and they patrol more often.

3.5. Roles in implementation

- integrate the benefits found through Sort, Set in Order, and Shine into the everyday work activity
- Make it a way of life
- It should be easily noticed when items are not in their place
- Keep it "visual"
- All 5S activities should be scheduled at the frequency rate necessary to maintain a clean, orderly, and safe work environment

Action steps for implementing

- Brainstorm ideas for making the 5S changes standard operating procedure. That may mean updating workplace procedures, checklists, job aids, diagrams and the like.
- Update documentation to reflect the changes. If your company has an ISO Coordinator, get the person involved to assure compliance with ISO requirements.



- Make sure all stakeholders are aware of the new standard inform and educate.

3.6. Creating conditions to sustain your plans

- Support from management, in terms of acknowledgement, leadership, and resources
- Rewards and Recognition for your efforts
- Satisfaction and Excitement for you and the company. 5S implementation builds as it involves more people.



Self-Check -3	Written Test
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Instruction: Write TRUE if the statement is correct or False if it is incorrect (2 point each)

1. Assign 3S responsibilities are one of the relevant procedures to standardize 3S.
2. 5S job cycle charts is a tools for assigning 3S responsibilities.
3. Rewards and Recognition for your efforts has a positive role to sustain your plans.

Note: Satisfactory rating – 2 and above points , Unsatisfactory - below 2 points

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

Answer Key

1. True
2. True
3. True

Answer Sheet-1

Score = _____
Rating: _____

Name: _____

Date: _____

Information Sheet-4	Checklists for standardize activities
---------------------	---------------------------------------

4.1. 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		Dept.: Assembly Dept. 1	Feb. 15, 1994		
		Assigned area	Entered by: McCarthy	Page	
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)

Figure 27: Standardization-level Checklist

To evaluate the effectiveness of the maintenance activities, the evaluator ranks the Sort, Set in order, and Shine levels on a scale of 1 to 5. Such checklists can be made for specific workshop and/or production processes. One example is shown in the Figure below. 5S Checklists like the one in the figure are used to check five pillar levels in the Checklists should be used to make weekly evaluation of five pillar conditions.

Factory: Tokai plant Checked by: NK		5S Checklist (for factories)		Scoring: 3 = Very good 2 = Good 1 = OK 0 = Not good						
Location	Check Item	Check Description	Year and month:							
			1	2	3	4	5	T		
Outdoors (overall)	Are storage areas clearly determined?	Areas for paring, pallets, temporary materials storage, delivered goods reception, trash processing, and boxes	0	2	0	2	0	4		
	Have paths been clearly defined?	Have white and yellow lines been laid down?	0	2	0	2	0	4		
		Are traffic signs used?	0	3	0	3	0	6		
		Are there any exposed wires or pipes?	1	3	1	3	1	9		
	Are outdoor areas kept clean?	Are ashtrays, trash cans, gardens, entrance areas, windows, and paths kept clean?	1	3	1	3	1	9		
	Are there any unneeded items?	Are signboards, copy machines, and pathways arranged properly?	1	1	1	1	1	5		
Clerical (overall)	Have temp storage areas been clearly defined?	Have fire-extinguishing equipment and emergency exits been established?	2	3	2					
	Are office areas kept clean?	Are the walls dirty?								

Figure 28: Figure: checklists for an entire factory



Self-Check -4	Written Test
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Instruction: Write TRUE if the statement is correct or False if it is incorrect (2 point each)

1. After the three pillar maintenance, checklist is not obligatory.
2. To evaluate the effectiveness of the maintenance activities, the evaluator ranks the Sort, Set in order, and Shine levels on a scale of 1 to 5.

Answer Key4

1. **False**
2. **True**

Information Sheet 5	Reporting to relevant personnel
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5.1. Reporting to relevant personnel

Inspection reporting shall present factual data accurately, fairly, and objectively and present findings, conclusions, and recommendations in a persuasive manner. Various means may be used to report on the results of inspection work, e.g., written reports, oral presentations, videos, or slide presentations. Regardless of the means used, there should be retrievable documentation of the reporting. The content of the reporting will be affected by the specific means used and the purpose it is serving. Reporting should be timely, complete, accurate, objective, convincing, clear, and concise.

Inspection reporting normally should describe the objective(s), scope, and methodology of the inspection and state that the inspection was conducted in accordance with the “Quality Standards for Inspection and Evaluation.” Also, inspection reporting should provide the reader with the context in which the subject matter being inspected should be viewed, such as the impact or significance of the program/activity being reviewed, to help ensure the focus is not too narrowly drawn and to give clearer understanding of the impact of any report recommendations. Reporting language should be clear and concise and, while recognizing that some inspections deal with highly technical material, should be written in terms intelligible to the intended recipients and informed professionals.

Reporting May include, but not limited to:

- Verbal responses
- Data entry into enterprise database
- Brief written reports using enterprise report formats

5.2. The Concept of Prevention

When we find that tools have not been put back correctly, we immediately take care of them. When we find an oil puddle on the floor, we immediately mop it up. Making these actions habit is the foundation of Standardize. However, when the same problems

keep on happening over and over again, it is time to take the concept of Standardize to the next level: prevention.

To take this pillar 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)? When we ask "why" repeatedly, we eventually find the source of the problem and can address that source with a fundamental improvement. Such improvements can help us develop Unbreakable standardization, which means:

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

Unbreakable Standardization	=	Unbreakable Sorting + Unbreakable Set in order + Unbreakable Shining
--------------------------------	---	----------------------------------------------------------------------------------

5.3. Brief written reports using enterprise report formats

There are five steps to follow while writing any kind of report

- Define the problem and the purpose
- Gather necessary information
- Interpret and analyze the information
- Organize the information
- Write the report

Here are some tips which might be useful in writing an activity report:

- Carefully plan the report. Identify the purpose of writing the report. ...
- Take your time in writing the report. ...
- Give your report a structure. ...
- Be honest. ...
- Write simply. ...
- Keep a backup copy of your report. ...



- Proofread.

Steps in Writing a Progress Report

- Figure out the purpose of your progress report. ...
- Begin by writing the header. ...
- Compose the introduction. ...
- Write the body of the report. ...
- Add a few details on your future plans for your project. ...
- Create a summary for your report. ...
- Review and revise your report.

5.4. Report Writing Format

Here are the main sections of the standard report writing format:

- **Title Section** – This includes the name of the author(s) and the date of report preparation.
- **Summary** – There needs to be a summary of the major points, conclusions, and recommendations. It needs to be short as it is a general overview of the report. Some people will read the summary and only skim the report, so make sure you include all the relevant information. It would be best to write this last so you will include everything, even the points that might be added at the last minute.
- **Introduction** – The first page of the report needs to have an introduction. You will explain the problem and show the reader why the report is being made. You need to give a definition of terms if you did not include these in the title section, and explain how the details of the report are arranged.
- **Body** – This is the main section of the report. There needs to be several sections, with each having a subtitle. Information is usually arranged in order of importance with the most important information coming first.
- **Conclusion** – This is where everything comes together. Keep this section free of jargon as most people will read the Summary and Conclusion.
- **Recommendations** – This is what needs to be done. In plain English, explain your recommendations, putting them in order of priority.

- **Appendices** – This includes information that the experts in the field will read. It has all the technical details that support your conclusions

Table 3: report writing format

Title -----

Introduction-----

Body-----

Conclusion-----

Recommendation -----

All the above report may report to the following relevant personnel such as

- Supervisors, managers and quality managers
- Administrative, laboratory and production personnel
- Internal/external contractors, customers and suppliers

Self-Check -5**Written Test****Direction I: Multiple choice questions**

Instruction: Choice the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

1. One of the following included in report writing:

- A. Verbal responses
- B. Data entry into enterprise database
- C. Brief written reports using enterprise report formats
- D. All of the above

2. Which one of the followings is not explain unbreakable standardization:

- A. Unbreakable sorting
- B. Occasional sorting
- C. Unbreakable setting in order
- D. Unbreakable setting shining

3. Types of report, reports orally to personnel

- | | |
|---------------------------|-------------------|
| A. Verbal response report | C. Written report |
| B. Database report | D. All |

Answer Key5

- 1. D
- 2. B
- 3. D

Note: Satisfactory rating - 2 points and above Unsatisfactory - below 2 points

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

Answer Sheet-3

Score = _____



Information Sheet-6

Keeping the workplace to the standard.

6.1. Standardized cleanup

Standardize is the fourth step of the 5S method. It means "standardized cleanup". It derives from the one-time Shine step which made the factory "shiny clean" and set the standard for cleanliness. Standardize makes it possible and feasible to live up to that standard.

Standardize enables and ensures compliance to the new standards of cleanliness. The benefits include:

- Maintaining the higher morale gained during Shine
 - ✓ Pride in the workplace
 - ✓ Relapsing into dirty or messy conditions means that the Shine effort was wasted
- Minimal investment in time: the goal is 5 minutes per worker per shift
 - ✓ No big clean-up before a visit from customers or executives
- Less downtime for equipment

6.2. How to Standardize Cleanup

The previous article introduced Standardize. This article will discuss "how to" standardize cleanup processes to maintain the Shine standard of cleanliness.

From the shine step, we have the following information about the cleanup process, or we have begun to list questions that require investigation:

- Tasks required in each work area
 - ✓ Clean surfaces
 - ✓ Disassemble, clean, and visually inspect machinery



- ✓ How to clean and where to store the cleaning tools (and consumables, such as detergents)
- Tools required for each task
- Sequence of tasks
- Time required for each task
- How often should this task be performed?
 - ✓ Daily, weekly or less frequently?
- Where does the dirt come from?
 - ✓ Can the source be eliminated or re-directed?

➤ **Daily Cleaning Tasks**

Each worker should have a set of daily cleanup tasks. These tasks may include:

- Wipe or clean tools before storing them in their appropriate racks
- Clean and inspect the machinery used during that shift
- Clean one's own workbench
 - ✓ Dust or wipe down work surfaces
 - ✓ Store workbench items properly – put the lids back on jars, for example
- Sweep a designated area of the floor
- Turn off or unplug power tools as required
- Visually check that everything is in place

This set of actions should not add more than about five minutes to each worker's set of routine daily tasks. One key is that this becomes the routine. For management to enforce the standards, the standards need to be documented. Since managers actively helped in the one-step Shine process, the photographs of the tidy workplace should be sufficient.

➤ **Weekly Cleaning Tasks**

It takes a bit more planning and organizing to ensure that weekly tasks are fully completed. Develop a binder for each work area, with clear instructions explaining these duties. Use a checklist to log who did each cleanup task. Follow up with a visual inspection of the task area, and by checking that the checklist has been signed.

Several successful repetitions are needed to make a change into a standardized habit. Daily and weekly tasks quickly become routine. Because of the time which elapses between the infrequent cleanup tasks, it will take longer to make them habitual and repeatable. Therefore it is vital to develop a system that works for your organization. Management should make these infrequent cleaning tasks into deliverables and inspect the results until satisfied that the change is habitual. You don't want to open a cabinet or move a machine and find a built-up mess that should have been addressed regularly.

6.3. . The Benefits of "Standardized Cleanup"

- Brief (about five minutes!) daily cleanup should:
 - ✓ Maintain cleanliness, and therefore avoid periodic large-scale cleanup projects
 - ✓ Support the sort and set in order initiatives: regular cleaning ensures that only useful objects are kept, and tools are stored in their proper places
 - ✓ Maintains the morale boost from the one-time shiny-clean step: the effort was not wasted; management really is committed; and everyone continues to work toward this common goal
 - ✓ Provides a daily visual inspection of equipment and facilities, so preventative maintenance can be performed at the earliest possible time
 - ✓ Makes it easier to note that tools and materials are stored properly at the end of each shift
 - ✓ Reinforces the culture of tidiness, so workers are less likely to leave a mess that they will just have to clean up later
- The less frequent cleanups – weekly or even less often – also have benefits:
 - ✓ Reinforces the good first impression of cleanliness and tidiness, because the less-used or less-visited areas are also well-maintained; there is no contrast between a showcase work station and a messy storage closet
 - ✓ Inspections reinforce the knowledge that management is committed to keeping the factory clean, tidy and organized
 - ✓ These also provide visual inspection of machinery



- The cleaner environment:
 - ✓ Reduces environmental health hazards – dust or pools of toxic liquids – for workers
 - ✓ Reduces the chances of slips and falls, by cleaning spilled liquids
 - ✓ Reduces wear on machinery, by cleaning the equipment and by reducing airborne grit that can get into moving parts



Self-Check -6	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: (5 pts each)

1. A set of daily cleanup tasks that each worker should do include:
 - A. Wipe or clean tools before storing them in their appropriate racks
 - B. Clean and inspect the machinery used during that shift
 - C. Clean one's own workbench
 - D. All
2. The cleaner environment: reduces environmental health hazards
 - B. True
 - C. False
3. Standardize does NOT enable and ensure compliance to the new standards of cleanliness.
 - A. True
 - B. False

Answer Key 6

1. D
2. A
3. B

Note: Satisfactory rating – 2 and above points ,
Answer Sheet

Unsatisfactory - below 2 points

Score = _____
Rating: _____

Information Sheet-7

Avoiding problems

7.1. Introduction

5S is the perfect tool to identify the first improvement projects in your company to eliminate waste. Although sometimes viewed as a housekeeping technique, it is actually an innovative management system that helps people think lean, paving the way for the adoption of Lean principles in the organization. Understanding the 5S methodology is one of the foundations of Six Sigma principles, and can be extremely beneficial for organizations of all kinds.

The fourth phase, standardize, focuses on maintaining the clean and safe working environment. Prior to this phase, all sorting and cleaning has been performed. This phase is there to set simple, visible guidance, how the area should be kept on daily basis. Different organizations have different ways to measure the maintenance of 5S. One of the most popular tools for standardizing is a 5S audit. These audits are kept after different time periods, for example once a month. The audit has set standards that are evaluated during the audits. Afterwards the results of the audit will be posted for everyone to see. This also helps to point out some problem areas and take actions to these.

7.2. Standardizing activities

Standardization will lead equalization of activities. Standardization is useful for;

- Easy implementation of S1 to S3 activities
- Equalization process output
- Everyone's participation

Standardization itself:

- Reduces training time: similar situations are documented in similar ways; basic tasks are performed in each work group; and experience co-workers can explain things to newcomers



- Reduces or eliminates confusion – each worker knows the tasks and responsibilities
- Improves morale by reducing the friction between workers with different personal tolerances for neatness, or different ways of storing tools
- Contributes to consistent quality and productivity

7.3. Prevent Things from Getting Dirty (Preventive Shine Procedures)

Preventive shine Procedures will prevent things from getting dirty to begin with. Anyone who has participated in 5S implementation can tell you that the initial cleanup is very hard work. To minimize the drudgery of cleaning up, the key is to treat contamination problems at their source. The 5Why approach can be applied to figure out why dirt is being generated, and how this problem can be fixed. For example, instead of mopping up oil puddles, figure out where the oil is leaking from and repair the leak.

4. Question: Why mop the floor every day?

Answer: Because oil collects on the floor.

5. Question: Does oil collect on the floor every day?

Answer: Because there's a leak from the drill press machine

6. Question: Why is there a leak from the drill press machine?

Answer: Because oil is leaking from a valve.

7. Question: Why is oil leaking from a valve?

Answer: Because it's broken.

8. Question: Why hasn't the valve been replaced?

Answer: Because we didn't notice it was broken

9. Question: How can we coordinate getting the valve fixed?

Answer: The maintenance team will order the part and the operator will replace it.

7.4. Problems that result when we do not implement Standardization well:

- Conditions go back to their previous and undesirable levels even after a companywide 5S implementation campaign.



- At the end of the day, piles of unneeded items are left from the day's production and lie scattered around the production equipment.
- Tool storage sites become disorganized and must be put back in order at the end of the day.
- Cutting shavings constantly fall on the floor and must be swept up.
- Even after implementing Sort and Set in order, it does not take long for office workers to start accumulating more stationery supplies than they need.

These problems and others reveal backsliding in gains made from implementing Sort, Set in Order, and Shine Activities. The basic purpose of the Standardize pillar is to prevent setbacks in the first three pillars, to make implementing them a daily habit, and to make sure that all three pillars are maintained in their fully implemented state.



Self-Check -7	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: (5 pts each)

1. Standardization is useful for:
 - A. Easy implementation of S1 to S3 activities
 - B. Equalization process output
 - C. Everyone's participation
 - D. All
2. Tool storage sites become disorganized when we implement Standardization
 - A. True
 - B. False
3. The basic purpose of the Standardize pillar is to prevent setbacks in the first three pillars.
 - A. True
 - B. False

Answer Key 7

1. D
2. B
3. A

Note: Satisfactory rating – 2 and above points, Unsatisfactory - below 2 points

Answer Sheet

Score = _____

Rating: _____

Operation Sheet 1	Procedures in Implementing Standardize
--------------------------	-----------------------------------------------

Sequence of Standardize

1. Select work area and necessary materials
2. Follow OHS principle
3. Plan for Standardization
4. Assign 3S Responsibilities for everyone in the work place by using the tools such as 5S Maps, 5S schedules, 5S job cycle charts
5. Integrate 3S Duties into Regular Work Duties by using the two approaches: visual 5S and five- minute 5S
6. Check on 3S Maintenance Level by using Standardization-level Checklist and 5S checklist and make maintenance/correction on back sliding the 3S.
7. Prevent back sliding of the first three pillars by using 5W1H approach, suspension, incorporation and use elimination.

LAP Test	Practical Demonstration
----------	-------------------------

Name _____ date _____

Time started _____ time finished _____

Instructions: Given necessary templates, tools and materials

You are required to perform the following tasks within 1 hour.

Task 1: Prepare standard to the sort activities in your workplace.

Task 2: Prepare standard to the set in order activities in your workplace.

Task 3: Prepare standard to the shine activities in your workplace.

- consider the
 - OHS procedures

:

List of Reference Materials

- 5S for operators (1995)
- www.kaizen-institute.com
- Barnes, T., "Kaizen strategies for successful leadership", 1996, Pitman Publishing London
- www.leankaizen.co.uk

Solar PV System Installation and Maintenance

Level-II

Learning Guide-03

Unit of competence:-	Standardize and sustain 3S
Module Title:-	Standardizing and sustaining 3S
LG Code:	EIS PIM2 M16 LO3 LG-03
TTLM Code:	EIS PIM2 TTLM 1019v1

LO 3: Sustain 3S

Instruction sheet**Learning guide #79**

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

- Preparing and following plan to sustain 3S activities.
- Discussing, preparing and implementing tools and techniques to sustain 3S.
- Inspecting workplace regularly
- cleaning up workplace before and after job activities.
- Identifying and specifying situations and taking actions.
- Recommending Improvements to lift the level of compliance in the workplace
- Following checklists and reporting to relevant personnel.
- Avoiding problems by sustaining activities.

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Prepare and follow plan to sustain 3S activities.
- Discuss, prepare and implement tools and techniques to sustain 3S.
- Inspect workplace regularly
- clean up workplace before and after job activities.
- Identify and specify situations and taking actions.
- Recommend Improvements to lift the level of compliance in the workplace
- Follow checklists and report to relevant personnel.
- Avoid problems by sustain activities.

Learning Instructions:**Learning Instructions:**

3. Read the specific objectives of this Learning Guide.
4. Follow the instructions described below 3 to 6.
5. Read the information written in the information Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5 and Sheet 6, Sheet 7, Sheet 8 in pages 79, 83, 92, 95, 97, 99, 103 & 105 respectively.

6. Accomplish the Self-check 1, Self-check 2, Self-check 3, Self-check 4 Self-check 5 and Self-check 6, Self-check 7 and Self-check 8 in pages 81, 91,94,96,98 ,102 and 106 respectively
7. If you earned a satisfactory evaluation from the “Self-check” proceed to Operation Sheet 1

Information Sheet-1	Preparing and following plan to sustain 3S activities
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1.1. Introduction to sustain

Sustain means to make a habit of properly maintaining correct procedures. In your life in general, what do you mean when you talk about sustaining something? Usually, you think of it as drawing on something from inside yourself in order to maintain a course of action-even when forces in your life challenge in this effort. Means making a habit of properly maintaining correct procedures

Example of “Sustain” activities

- Regular progress reporting
- Refresher training
- Periodical evaluation of 5S activities with proper advices for continuation and further improvements
- Appreciation, recognition and awarding on good 5S activities
- Reminder using 5S corner, new letters, good practice sheet etc.

1.2. Benefits of Sustain

- cleaner, safer, working environment
- Detailed tasks are documented to make processes more efficient
- Work place is maintained in an organized fashion without clutter
- Tools and materials are easier to find
- Increasing Awareness And Morale,
- Decrease In The Amount Of Mistakes That Arise Due To Un-necessaries’,
- Improvement In Internal Communication Processes,
- Improvement In Inter-Human Relations

1.3. Sustain Implementation

The implementation of the sustain pillar is different from that of the sort, set in order, shine, or standardize pillars in that the results are not visible and cannot be measured. Commitment to it exists in people's hearts and minds and only that have shown its presence. Because of this it cannot exactly be “implemented” like a technique, However, we can create conditions that encourage the implementation of the sustain pillar.

The five pillars that will help to sustain types of conditions that are most useful for this are:

- **Awareness.** You and your coworkers need to understand what the five pillars are and how important it is to sustain them.
- **Time.** You need to have or make enough time in your work schedule to perform 5S implementation.
- **Structure.** You need to have a structure for how and when 5S activities will be implemented.
- **Support.** You need to have support for your efforts from management in terms of acknowledgement, leadership, and resource
- **Rewards and Recognition.** Your 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.

1.4. Roles in Implementation

In order to sustain 5S implementation in your PV system project both you and the project management have important roles to play. Part of this role involves creating the conditions that sustain 5S activities. The other part involves demonstrating a commitment to 5S yourself.

A. The Role of Management

The supervisors and managers in your project have a major role to play in ensuring the success of the five pillars by creating conditions that help sustain 5S activities. This role includes:

- educating you and your coworkers about 5S concepts, tools, and techniques;
- creating team for implementation
- allowing time for implementation and creating schedules for this work
- Providing resources for 5S implementation. such as supplies.
- acknowledging and supporting 5S efforts
- Encouraging creative involvement by all workers, listening to their ideas, and acting on them.
- creating both tangible and intangible rewards for 5S efforts
- promoting ongoing 5S efforts

Your supervisors and managers also have an important role to play in implementing the fifth pillar in their own work. When they sustain the first four pillars, they perform three very important functions.

- improving the quality and efficiency of their own work
- teaching by example
- demonstrating the company's commitment to 5S implementation

B. Yours Role

Similarly, you have an important role to play in creating the conditions that Sustain 5S activities. This role includes:

- 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

You also have an important role to play in order to sustain 5S activities in your own work.

This role includes:

- 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

Self-Check -1**Written Test****Direction I: Multiple choice questions**

Instruction: Choice the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

1. It is the 5th pillar of 5S
 - A. standardize
 - B. sustain
 - C. set in order
 - D. sort
2. one of the following is the benefit from sustain
 - A. Tools and materials are easier to find
 - B. Increasing Awareness And Morale
 - C. Improvement In Inter-Human Relations
 - D. all

Note: Satisfactory rating - 1 and above points , Unsatisfactory - below 1 points

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

Answer Key1

1. B
2. D

Answer Sheet-1

Score = _____

Rating: _____

Name: _____

Date: _____

Information Sheet- 2	Discussing, preparing and implementing Tools and techniques to sustain 3S.
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2.1. Common Tools and techniques to sustain 5s

There are many tools and techniques your company can use to help sustain commitment to 5S implementation. We offer these below so you will be aware of them. At some point in your 5S implementation work, you may be called upon to use or even coordinate the use of these techniques. These are:

- 5S posters
- 5S photo exhibits and storyboards
- 5S newsletter
- 5S maps
- 5S pocket manuals
- 5S department/benchmarking tours
- 5S months
- 5S audit
- Awarding system
- Big cleaning day
- Patrolling system May include, but not limited to:
 - ✓ Top management Patrol
 - ✓ 5S Committee members and Promotion office Patrol
 - ✓ Mutual patrol
 - ✓ Self-patrol
 - ✓ Checklist and
 - ✓ Camera patrols

2.2. 5S Slogans

5S Slogans communicate the themes of the five pillar campaign in your company. They are most effective when they are suggested by you and your coworkers. They can be displayed on buttons, stickers, flags, or posters. It encourages all the participants.

2.2.1. 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”

2.2.2. 5S Posters

Posters displaying 5S Slogans or descriptions of 5S activities can be posted throughout the workplace. They can serve to remind everyone of the importance of the five pillars, or to communicate the results or status of 5S activities.

- posted throughout the workplace
- remind everyone of the importance of five pillars
- communicate results/status of 5S activities



Figure 29: Samples of poster

2.2.3. 5S Photo Exhibits and Storyboards

When it comes to communication about 5S implementation, the old saying that a "picture is worth a thousand words" is definitely true. Photo Exhibits and Storyboards showing the before and after of 5S implementation activities are powerful tools for promoting the five pillars. Photos and Storyboards can also communicate the status of five pillar activities.

- powerful tools for promoting five pillars
- communicate status of five pillar activities

2.2.4. 5S Newsletters

5S Newsletters are in-house news bulletins centered on five pillar topics. They carry factory reports on 5S conditions and activities. 5S Newsletters are most effective when issued on a regular basis, perhaps once or twice a month and at staff meetings.

- In-house news bulletins centered on 5S topics
- Carry factory reports on 5S conditions/activities

2.2.5. 5S Maps

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.

- Hang in central location with suggestion cards attached so anyone can suggest improvements

2.2.6. 5SPocket Manual

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.

- Create 5S Pocket Manual that contains five pillar definitions and descriptions, and is small enough to fit into the pocket of work clothes.

2.2.7. 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.

- When one department has implemented the five pillars successfully, it can serve as a model area for other departments to come and visit

2.3. 5S Months

The project 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 further promote 5S implementation in the company.

- Companies should designate two, three, or four months every year as “5S Months”—5S seminars, field trips, and contests can be carried out to further promote 5S implementation

2.3.1. 5S Audit

- The purpose of this audit is to outline an approach making 5S a success in industrial as well as our working areas.
- Enable 5S teams to design and establish a simple, effective and visual workplace organization, which creates a professional workplace and culture that is effective, organized and disciplined.
- Continual Improvement internal audit program enhance excellent service delivery
- Audit findings can be used to identify trends and the key issues.

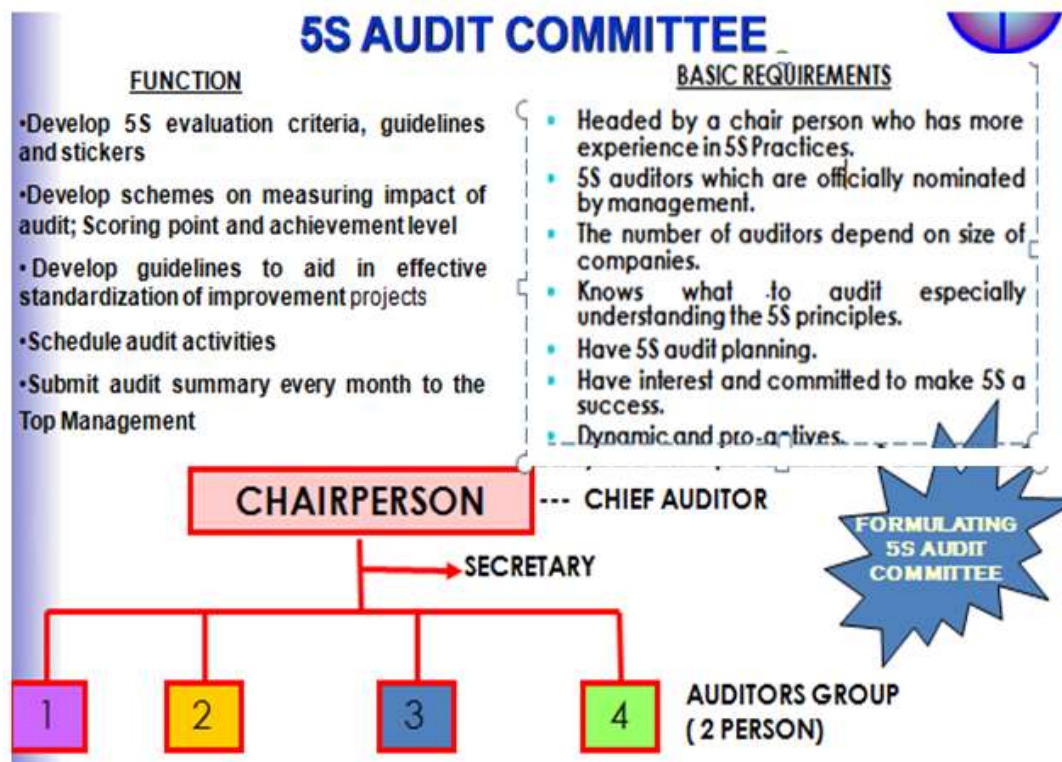


Figure 30 : 5S audit committee

2.3.2. Performing Audit

➤ Preparation

- All 5S auditors gather at the meeting room ½ hour before audit
- Briefing by 5S audit chairman:-
 - ✓ Activities of the day

- ✓ Highlight any new criteria to be checked
- ✓ Action date on sticker (2 weeks from audit date)
- ✓ Time to report back
- Wearing 5S auditor tag
- Every auditor is only allowed to use up to 3 stickers at each audit to each 5S zone. It is purposely not put burden to 5S team to make improvement in very drastic manner.
- Previous audit summary report will be distributed to the auditors' team as a reference in order to avoid in consistency auditing.

2.3.3. During Audit

- Bring all audit materials e.g. checklist, stickers, file holder & audit summary report
- Get the leader or facilitator to accompany auditor
- Good public Relation
- Check outstanding matter from the previous audit summary report
- Proper issue of stickers & justified
- Propose idea for improvement and justified.
- Close matter when action has been taken. Remove sticker
- Issue new sticker when action is not fully satisfied (old sticker still remain) and also for new matter noted
- Take photo as an example in case of the 5S team has shown very creative idea to make the 5S initiative significantly effective, safe work place, cost saving
- Only use maximum 3 stickers of each type for each working area / zone
- Listen to the feedback given by workers
- Provide positive suggestion for improvement if stickers is not appropriate
- Prepare audit report of each working area on the Audit summary
- .Document must be signed by auditor & team leader
- Audit to the next area
- You may take 10 – 15 minutes for one zone

2.3.4. 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 first in, first out (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?

2.4. Develop 5S Evaluation Criteria & Guidelines

1. Set up audit checklist criteria according to area of 5S team

ASPECTS	N O	AUDITED ASPECT	SCORE					REMARKS
			5	4	3	2	1	
FLOOR	1	NO DUST ON THE FLOOR						
	2							
	3							
EQUIPMENTS ARRANGEMENT	4	TIDY AND WELL ARRANGED						
	5							
	6							
EQUIPMENTS AND TOOLS	7	IN GOOD CONDITION AND BEING USED						
	8							
	9							

2. Set-up “Audit Summary Report”

Audit Area : Group 5S
Date:

No	Areas of Audit	Improvement Needed			Contoh Cemerlang	Situation During Audit	Proposed Enhancement
		Sort	Set In Order	Shine			

Auditor: a)

Signature:

b)

Signature:

2.5. CRITERIA FOR 5S AUDIT RATING

RATING ACCORDING TO SCALE 1 TO 5

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.

2.5.1. Awarding System

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

Awards may be:

- ✓ For Good performance
- ✓ Award for efforts
- ✓ Award for good Ideas
- ✓ Prize winner
 - Group
 - Individual

2.5.2. Big Cleaning Day

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

Example: Before national holidays.

2.5.3. Patrolling System

- Top management Patrol
 - ✓ Check Up the activities Comprehensively
 - ✓ Give emphasis on sustaining of the activity
 - ✓ consider committees feedback
- 5S Committee members and Promotion office Patrol
 - ✓ Evaluate “5S Check List”
 - ✓ Record problems on “5S check findings”
 - ✓ Tack picture of 5S problems
- Mutual patrol
 - ✓ Check mutually among KPT
- Self-patrol
 - ✓ 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.

Self-Check -2**Written Test**

Directions: - For the following statements, write TRUE if it is correct or write FALSE if it is incorrect on the answer sheet.

1. 5S Newsletters are in-house news bulletins centered on five pillar topics.
2. Posters displaying 5S Slogans or descriptions of 5S activities can be posted throughout the workplace
3. Awarding for 5S promotion results according to evaluation is recommended for Good performance

Answer Key2

1. True
2. True
3. True

Note: Satisfactory rating - 2 points and above Unsatisfactory - below 2 points

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

Answer Sheet-2

Score = _____

Rating: _____

Name: _____

Date: _____

Information Sheet- 3	Inspecting workplace regularly
-----------------------------	---------------------------------------

3.1. Introduction to workplace inspection

Workplace inspections help prevent incidents, injuries and illnesses. Through a critical examination of the workplace, inspections help to identify and record hazards for corrective action. Health and safety committees can help plan, conduct, report and monitor inspections. Regular workplace inspections are an important part of the overall occupational health and safety program and management system, if present.

Formal inspections can take different forms and you and your representatives will need to agree the best methods for your workplace. Here are some of the ways inspections can take place.

- Safety tours - general inspections of the workplace
- Safety sampling - systematic sampling of particular dangerous activities, processes or areas
- Safety surveys - general inspections of particular dangerous activities, processes or areas
- Incident inspections carried out after an accident causing a fatality, injury, or near miss, which could have resulted in an injury, or case of ill health and has been reported to the health and safety enforcing authority.

3.2. Purpose of inspection

Inspections are important as they allow you to:

- listen to the concerns of workers and supervisors
- gain further understanding of jobs and tasks
- identify existing and potential hazards
- determine underlying causes of hazards
- recommend corrective action
- monitor steps taken to eliminate hazards or control the risk (e.g., engineering controls, administrative controls, policies, procedures, personal protective equipment)

3.3. Following-up after an inspection

After an inspection:

- Explain the reasons for any follow-up action you decide to take to your representatives.
- Let the representative who notified you of the inspection have the opportunity to inspect again so they can check if the issues raised got appropriate attention, and record their views.
- Share the follow-up action taken throughout the workplace and other relevant parts of the business, including the health and safety committee where there is one.

Self-check sheet-3	Written test
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Directions: - For the following statements, write **TRUE** if it is correct or write **FALSE** if it is incorrect on the answer sheet.

1. Inspection is to listen the concerns of workers and supervisors.
2. Regular workplace inspections are an important part of the overall occupational health and safety program and management system.
3. Inspections is not recommended for corrective action

Answer Key3

1. True
2. True
3. False

Note: Satisfactory rating - 2 and points above , Unsatisfactory - below 2 points

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

Answer Sheet-3

Score = _____

Rating: _____

Name: _____

Date: _____

Information Sheet-4	Cleaning up workplace before and after job activities.
---------------------	--------------------------------------------------------

1.2. Introduction

Developed in Japan, 5S is a system of organizing workplace for efficiency, effectiveness and safety. 5s is important because the implementation is about empowering employees to control their work area and create an environment where they want to work every day. It is a program that only works with grass roots level engagement. With commitment to safety, we are equally committed to 5S to ensure a safe place to work. It enabled us to indicate where waste was occurring and thus improve the work area sustainably. We recognized real problems, found solutions and ultimately we were successful in our endeavors.

1.3. Determining shine methods

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

Table 4: Sustaining cleaning activity (Sample applied on a given area)

Type of cleaning	Time	Frequency (timing)
Daily cleaning	5 – 10 min.	Minor operation before/after working hour at each shop
Weekly cleaning	15 – 30 min.	Weekend
Monthly cleaning	30 – 60 min.	End of month
Big cleaning days	2 – 4 hrs.	Before national holidays
Location which is not easy to clean	1 – 2 days	In case of necessity for assistance request

		to other division
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Self-Check -4	Written Test
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Direction I: Multiple choice questions

Instruction: Choice the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

- Which of the following will define what will be cleaned in each area and what supplies and equipment will be used?
 - Standards for shine procedure
 - The five minute shine
 - Choosing targets and tools
 - None
- 5s is important because the implementation is about empowering employees to control their work area.
 - True
 - False
- Cleaning should be practiced daily and should require a lot time for five minute shine.

Answer Key

- C
- True
- False

Note: Satisfactory rating –5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Information Sheet-5	Identifying and specifying situations and taking actions.
---------------------	-----------------------------------------------------------

5.1 Problems Avoided by Implementing Sustain

Here are some of the things that happen in a company when Commitment to the five pillars is not sustained.

1. Unneeded items begin piling up as soon as sorting is completed
2. No matter how well Set in Order is planned and implemented, tools and jigs do not get returned to their designated place after use.
3. No matter how dirty equipment becomes, little or nothing is done to clean it.
4. Terms are left protruding into walkways, causing people to trip and get injured.
5. Dirty machines start to malfunction and produce defective goods.
6. Dark, dirty, disorganized workplaces lower workers' morale.

These 5S related problems and others are likely to occur in any factory or office that lacks a commitment to sustain the five pillar gains over time.

5.2.Creating Conditions to Sustain Your Plans

The implementation of the sustain pillar is different from that of the sort, set in order, shine, or standardize pillars in that the results are not visible and cannot be measured. Commitment to it exists in people's hearts and minds and only that have shows its presence. Because of this it cannot exactly be “implemented” like a technique, However, we can create conditions that encourage the implementation of the sustain pillar.

For instance, going back to our exercise program example, how could you create conditions in your own life that would encourage sustaining your plan to work out at a gym three time a week? You might:

- Join a gym with a friend so you can work out together and encourage each other (see Figure above).
- Create a workout schedule with your friend.
- Make a plan with your spouse to eat dinner later three nights a we so you can go to the gym after work.
- Get extra sleep on the nights before you work out, so that you will not be too tired by the end of the day to follow through with your exercise plan.

These conditions would make it easier for you to sustain your schedule for exercising at the gym three times a week.

Self-Check -5	Written Test
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Instruction: Choice the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

1. When Commitment to the five pillars is not sustained:
 - A. Unneeded items begin piling up as
 - B. Tools and jigs do not get returned to their designated place after use.
 - C. No matter how dirty equipment becomes, little or nothing is done to clean it.
 - D. Terms are left protruding into walkways, causing people to trip and get injured.
 - E. All
2. You and your coworkers need to understand what the five pillars are and how important it is to sustain them
 - A. True
 - B. False
3. The implementation of the sustain pillar is similar to the rest of 5Ss
 - A. True
 - B. False

Note: Satisfactory rating –2 and above points, Unsatisfactory - below 2 points

Answer Key

1. D
2. A
3. B

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Information Sheet-6	Recommending Improvements to lift the level of compliance in the workplace
----------------------------	-----------------------------------------------------------------------------------

6.1. 5S Workplace Organization

5S is one of the most widely adopted techniques from the lean manufacturing toolbox. Along with Standard Work and Total Productive Maintenance, 5S is considered a “foundational” lean concept, as it establishes the operational stability required for making and sustaining continuous improvements.

The primary objective of 5S is to create a clean, orderly environment- an environment where there is a place for everything and everything is in its place. Beyond this, many companies begin their lean transformation with 5S because it exposes some of the most visible examples of waste it also helps establish the framework and discipline required to successfully pursue other continuous improvement initiatives.

6.2. 5S Implementation in the Office

As a company holistic approach, 5s implementation in the office activities must fully support shop-floor manufacturing operations to eliminate waste as a means to improve productivity. When developing a culture of continuous improvement, 5S improvement steps mirrors our attitudes and behavioral patterns during the transformation process. Although not manufacturing, you can consider the office as a paperwork factory. Like manufacturing, adopting the 5S principles throughout the office and administrative functions increases efficiency.

The 5S management philosophy eliminates waste and improves office organization and standardization. 5S serves as the foundation for continuous improvement activities and provides the base for applying other Lean methodologies. It also supports the cornerstones of employee engagement. Although 5S concepts are simple and easy to understand, many organizations fail in the implementation process. Companies mistake 5S as a spring cleaning program. However, 5S, when applied correctly, continuously improves workplace organization and improves productivity.

6.3. The Three Different Types of Workplace

A. 3rd class workplace:

- Have people who make a mess and no one cleans up.

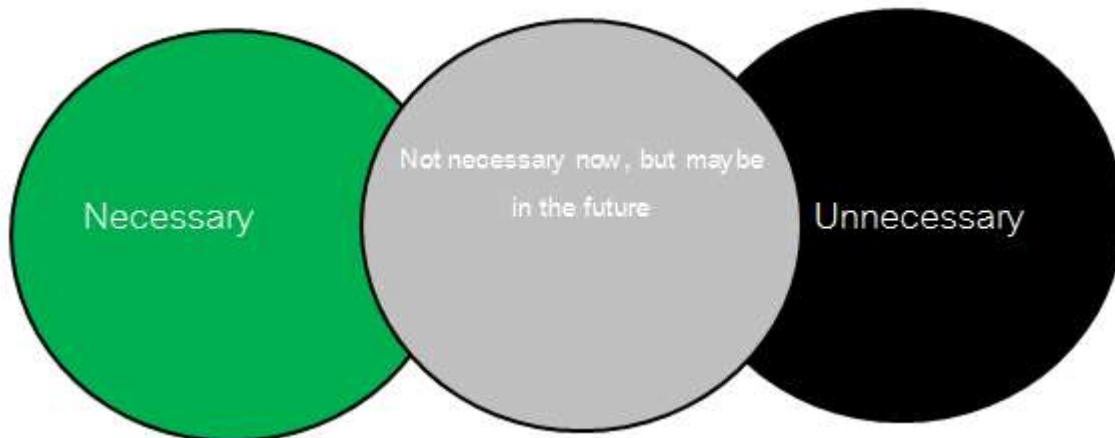
A. 2nd class workplace:

- Have people who make a mess and another group of people cleans up.

A. 1st class workplace:

- Have people who don't make a mess and yet everyone cleans up.

How mess occurs at workplace?



6.4. 5S Workplaces

Key components of the 5S philosophy are safety and good housekeeping practices. Safety is an integral part of the sort, set in order and shine segment of any 5S project. Standardize and sustain refers to methods used to ensure that safety and good housekeeping is maintained. Check sheets can be used to build good habits in these areas and to ensure good housekeeping is maintained in all areas. Implementing the 5S method means cleaning up and organizing the workplace in its existing configuration. It typically is the first lean method that organizations implement. This lean method encourages workers to improve their working conditions (including safety and ergonomics) and helps them to learn to reduce waste, eliminate unplanned downtime and conduct in-process inventory.

The 5S methodology typically is implemented using a three-step process, which includes establishing a cross-functional team (including employees who work in the associated areas), touring all areas associated with the manufacturing processes under review and brainstorming ways to improve organization to reduce waste. For example, factories usually have a great deal of waste associated with searching for items. It is not unusual for a 3-hour

changeover routine to include 30 minutes of searching. When attempting to reduce changeover time radically (for example, going from 3 hours to 10 minutes), there clearly is no room for 30 minutes of searching waste.

For example, team members might observe workers walking long distances to obtain needed parts, or spending time reaching into bins on shelves to find parts. Or they may identify hardware, like nuts, bolts and screws that are used in a certain area, but stored in a central storage facility far away from the point of use.

Audits can be conducted to review 5S progress in particular processes from level 1 (initial effort) to level 5 (habit). In the “Shine” category, for example, the goal is to have a system in which work area housekeeping is a routine way of life and corrective action measures are in place to address cleanliness issues.

Safety also plays an important role in the 5S audit process. Standard worksheets are developed for each process to help make a factory more visual, highlighting safety precautions for each cell, in addition to showing where all work in process should be located.

A clean, well-organized and safe work environment is, of course, an efficient and productive work environment. A less obvious, but still important, aspect of lean is that it gets the employees involved throughout the process, engaging and challenging best practices, encouraging the employees to have a real sense of involvement and to work hard to maintain all the effort the team has invested.

Self-Check -6	Written Test
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Instruction: Chose the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

- Which of the following is true about 3rd class workplace?
 - Have people who make a mess and no one cleans up
 - Have people who make a mess and another group of people cleans up
 - Have people who don't make a mess and yet everyone cleans up
 - None
- The primary objective of 5S is to create a clean, orderly environment- an environment where there is a place for everything and everything is in its place.
 - True
 - False
- A clean, well-organized and safe work environment is, of course, an efficient and productive work environment.
 - True
 - False

Note: Satisfactory rating –5points

Unsatisfactory - below 5points

Answer key6

- A
- A
- A

Answer Sheet

Score = _____

Rating: _____

Information Sheet-7	Following checklists and reporting to relevant personnel.
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7.1. 5S Checklist for PV installation

In a PV installation environment, generating the 5S in practice can bring in results that could considerably raise the environmental performance in line with the improved housekeeping and health & safety. Generating the 5S checklist for PV installation prior to auditing comes in different forms. There are a total of 25 evaluation criteria covering the 5S principles. Such criteria requires to perform work up-to-date and length of time the inventory, materials in queue in the area covering the principles of sorting, straighten, shine, standardize and sustain are classified under the items found in the PV installation environment like devices (battery, controller, modules, etc.), equipment, tools, storage areas, uncluttered with no unnecessary items, documents and boards. Because the 5S Methodology relies on organized, standard practices and processes to improve and sustain quality in production, the 5S checklist for PV installation divides each of the housekeeping stages that are graded from zero to four, with zero being unacceptable and four meaning outstanding or perfect.

Self-Check -7	Written Test
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Instruction: Chose the best answer from the given alternative and write your answer on the answer sheet provided in the next page (2 point each)

1. which of the following is not example of sustain activities?
 - A. Regular progress reporting
 - B. Refresher training
 - C. Appreciation
 - D. recognition
 - E. All
2. Generating the 5S checklist for PV installation prior to auditing comes in different forms.
 - A. True
 - B. False

Note: Satisfactory rating –5points

Unsatisfactory - below 5points

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

Answer Key 7

1. D
2. A

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Information Sheet-8	Avoiding Problems By sustaining Activities
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8.1. Sustaining Activity

Support activity that may not directly contribute to customer value, product quality or revenue generation, but is necessary for an organization continuity.

8.2. Identify options for avoiding or controlling the risk of sub-optimal performance

Whenever an example of a factor contributing to sub-optimal performance is identified there are a number of factors to consider.

- The how, why, what, where and when of change
- Up-front costs and possible long term savings
- Personnel implications, for example, training, resistance, numbers, changes in management
- Customer implications, for example, improved service, increased cost, turnaround time
- Supplier implications, for example cost, availability, supplier's quality system
- Documentation
- Flow on changes to other aspects of the workplace.

This range of factors will lead to the generation of a number of options including:

- do nothing (too expensive, customer does not need it, supplier cannot supply)
- do it all at once ('crash through' approach)
- do it over time (often easier to gain staff acceptance this way)
- Avoid the risks completely (eg replace modules, replace staff, pull out of this testing)
- control the risks (better QA, more sensitive QC).

Self-Check -8	Written Test
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Directions: - Matching Questions

Column “A”

1. Do nothing
2. Do it all at once
3. Do it over time
4. Avoid the risks completely
5. control the risks

Column “B”

- A. better QA, more sensitive QC.
- B. replace modules, replace staff
- C. easier to gain staff acceptance
- D. crash through approach
- E. customer does not need it, supplier cannot supply

Note: Satisfactory rating –3 and above points, Unsatisfactory - below 3 points

Answer Key8

1. E
2. D
3. C
4. B
5. A

Operation Sheet	Procedures in Implementing Sustain
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Sequence of Sustain

1. Planning
2. Set schedules for sustaining techniques
3. Prepare sustaining Tools and Techniques
4. Implement sustaining activities
5. Feedback comments on the sustain results



LAP Test	Practical Demonstration
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Name: -----Date:-----

Time started: -----

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

Task 1: Prepare slogans and posters for your work area.

Task 2: Evaluate your work place by using the 5S check list and use stickers.

Task 3: Prepare audit summary report by using the given template.

- identify the:
 - person -in-charge
 - technology workshop
 - work station
- consider the:
 - OHS procedures
 - workplace procedures and standards (work area)
 - frequency of maintenance activities

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