



# **Solar PV System Installation and Maintenance**

## **Level II**

# **Learning Guide- 32**

<b>Unit of Competence: -</b>	<b>Prepare Construction Materials and Tools</b>
<b>Module Title: -</b>	<b>Preparing Construction Materials and Tools</b>
<b>LG Code:</b>	<b>EIS PIM2 M08LO1 LG-32</b>
<b>TTLM Code:</b>	<b>EIS PIM2 TTLM 0120V1</b>

## **LO 1: Identify materials, Tools and Accessories**



## Instruction Sheet

## Learning Guide -32

This learning guide is developed to provide you the necessary information, knowledge, skills and attitude regarding the following content coverage and topics:-

- Identifying and list materials, tools and accessories as per job requirements
- Confirming quantity and description of materials with the job requirements

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:-

- Identify and list materials, tools and accessories as per job requirements
- Confirm quantity and description of materials with the job requirements

### **Learning Instructions:-**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4.
3. Read the information written in the information Sheet 1, Sheet 2 in pages 3, 6 respectively.
4. Accomplish the Self-check 1, Self-check 2, in pages 5, 11 respectively



## Information Sheet-1

## Identifying and list materials, tools and accessories

### 1.1. Identifying construction materials, tools and accessories

Most of the tools needed for a PV installation are commonly used and easily identified using the tasks that are performed. There are very few highly specialized tools. Below are several lists that describe many of the tools needed for an installation. They are divided into functional groups for site assessment, installation and maintenance. Most of the specialized tools fall into the site assessment and maintenance categories; the installation tools are found in the list of the tool box.

Site assessment tools	Basic tools	Battery System tools
50-100 ft. tape measure	Angle finder	Hydrometer or Refractometer
Solar Pathfinder	Torpedo level	Small flashlight
Compass	Fish tape	Rubber apron
Maps	Chalk line	Rubber gloves
Digital camera	Cordless drill	Safety goggles
	Unibit and multiple drill bits (wood, metal)	Baking Soda
	Hole saw	Turkey Baster
	Hole punch	Funnel
	Torque wrench with deep socket	Distilled Water
	Nut drivers	Voltmeter
	Wire strippers	
	Crimpers	<b>For multiple installations</b>
	Needle-nose pliers	DC clamp-on ammeter
	Lineman's pliers	Reciprocating / Jig saw
	Slip-joint pliers	Right angle drill
	Small cable cutter	Conduit bender



	Large cable cutters	Large crimpers
	AC/DC multi meter	Magnetic wristband
	Hacksaw	C-clamps
	Tape measure	Stud finder
	Blanket, cardboard or black plastic	Pry bar
	Heavy duty extension cords	
	Caulking gun	
	Fuse Pullers	



### Self-Check -1

### Written Test

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page: 3 points each

1. Which of the following solar assessment tool is used for assessing the solar potential?  
A. Compass                                      C. Solar panel  
B. Hack saw                                      D. solar path finder
  
2. \_\_\_\_\_ the material used for construction of solar PV installation is  
  
A. Brick                                      B. Cement  
C. Gravel                                      D. all

**Note: Satisfactory rating - 2 points**

**Unsatisfactory - below 1 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions



## Information Sheet-2

## Confirm quantity and description of materials

### 2.1 Conforming quantity and description of materials

The quantity and description of materials are prepared as bill of quantity for each installation and the contract document is signed between the contractor and the organization. The quantities and materials required and approved by the organization will be listed in each of the following works.

- ✓ Excavation and earth works
- ✓ Concrete works
- ✓ Building works
- ✓ Carpentry works
- ✓ Metal works
- ✓ Finishing works
- ✓ Plumbing works
- ✓ Roofing works
- ✓ Painting works
- ✓ Electrical works

Table 1. Materials needed for the construction of solar PV

Items	Materials
Excavation and earth works	Steel
	Special oil
	Steel rod reinforced(410N/m <sup>2</sup> )
	Cast ready mix plain concrete
	Polythene sheet
	Decorative arches
	Hollow cement block
Concrete Works	Approved additives and admixtures
	underground reinforced concrete elements with two coats of hot

	bituminous paint (75/25) after primer layer
	Electrical, plumbing and floor drainage in floor slabs including final floor slab
	, ground beams, ground slabs and Apron. the compaction should not be less than 98% of MDD.
	reinforcement steel ( $f_y = 410 \text{ N/mm}^2$ )
	ready mix plain concrete B (200) $\text{kg/cm}^2$ for Blinding beds 5 cm thick including polythene sheets as per specifications and drawings.
	reinforced concrete B(250) $\text{kg/cm}^2$ for the ground slab
	Ditto but 10cm thick entrance ramps and platform, for ground beams, strap beams between the foundations, ground beam for the platform, stair cases, for wall parapet in corridors, sills, lintels, coping, concrete wall (hunches for doors), gas room elements
Building Works	hollow or solid cement block (compressive strength $35 \text{ kg/cm}^2$ for hollow block and $60 \text{ kg/cm}^2$ for solid block
	cement mortars, galvanized steel ties, reinforced concrete infill
Carpentry Works	good wood grade “A” including frame cover mould, architrave, sanding sealer, prime coats
	at least two coats of oil paint
	framed fibber bulletin board
	Plywood veneer 5 mm thick on the back
	wall mounted magnetic green chalk board Lina serie
	soft wood coat hook rail smoothed , plugged and screwed to wall at 30cm center to center including priming and varnish painting with Galvanized steel coat hook 3mm thick,
Aluminum and metal works	aluminum windows
	glass 4 mm thick
	Ironmongery
	sliding leaves



	minimum two coats of colored oil paint
Finishing works	galvanized wire mesh
	Plastering: covering all conduits of electricity, water supplies , wires and nails and cleaning of surfaces
	Tiles works
	ceramic floor tiles
	Local marble must be Grade (A)
	high quality Granite
	white cement to fine aggregate (Quartz)
	fire extinguisher
Plumbing works	Pipe sleeves
	concrete and/or brick ducts in floors, walls
	Fixing brackets, clips, holder bats, hangers,
	Nails, screws, bolts, nuts, washers, holes, plugs, sleeves
	Painting of pipes excavation, concrete, benching, plastering, backfilling
	Nipples, connections, sockets, ferrules, couplings, back nuts, unions, and the like,
	Bends, elbows, tees, reducers, access doors, cleaning eyes, blank caps, stop valves, and the like,
	Welded joints and connections including grinding,
	galvanized pipe
	oil painted galvanized steel threaded pipe
	automatic float valve, overflow pipe (1" diam) and drip tray
	concrete for walls and base, slab, with cast iron cover
Roofing Works	Fittings including bolts, hook bolts, screws and washers,
	polystyrene sheets, mastic sealant, aluminum, protection steel, demolish safely corridor concrete and block walls
	Roof sheets of any width or length
	plasticized bitumen roofing membrane with chipping





	expansion joint on the roof
Painting Works	Preparation of surface including puttying, sealing and priming
	multi colours
	Paint the internal walls up to a height of 2.2m above finishing floor level with one coat pendrole, two coats of putty, one undercoat primer and two coat of oil paint
	Paint, external walls with one coat of Pendrole primer and at least two coats of External quality of colored emulsion (Weather Shield)
Electrical Works	conduits, connection boxes, controls, wires, connectors, clamps, bolts, and connecting the cables to switchboards and common electric network
	fluorescent light fixture, glops
Lighting, switching and outlet works	install, connect and test Ac LED tube length 1200mm,(18-21)Watt
	fluorescent tubes, ballasts ,condensers and rewiring to be compatible
	PVC pipes and boxes for Lighting Unit or Ceiling Fan
	bulk head light, water proof IP65, LED lighting fixture 16W
	Ditto but triple pole switches with cover plate, triple pole switches with cover plate, two ways switch "Fixel"1P 16N , Light Pushbutton 16A 1P, install connect and, testing single socket outlet 16A
	conduits, wiring, necessary accessories. PVC conduits, J.bboxes, cables, and all necessary accessories, socket outlet, complete with net cable Teldor ,cable should lablled on both ends by high quality sticky plastic lables,
Earthing System	galvanized 35x3 mm steel sheet, cables, earthing pits ,copper rods 19mm dia, 3m long, manholes,Cu stranded wire 35mm <sup>2</sup> in 2" flixable pipe , clamps ,Chemical treatment of the soil, accessories Ressistance less than 2 Ω.
Electrical distribution boards	Ditto 80x60x20cm one door.
	Supply and install three phase C.B 3x50A,three phase C.B 3x25A.
	two pole C.B 3x20A,Single phase C.B 1x16A,Single phase C.B



	1x10A,three phase 4 poles residual current ELC.B 4x25A, 0.03A,
	Step relay 10A ,220V, 3 indication lamps R S T with resistance 220V,
	with LTL fuse3x36/6A,Current transformer (60/5A), Amper Meter (0-100),Voltmeter 0-500V with 7 positions selector switch with LTL fuse3x36/6A
Cables and conduits	Supply and install the following cable XLPE cable 5x16 mm <sup>2</sup> , XLPE cable 5x10 mm <sup>2</sup> , XLPE cable 5x6
	installing 60cm manhole with 8 ton cover, 15cm base coarse underground 4" PVC piping system for power cable at depth 90 cm
	The work includes excavation 50 cm width, backfilling with clean sand , laying pipes, warning tapes,



### Self-Check -2

### Written Test

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page: each 3 points

Choose the best answer

1. Which of the following materials are used for concrete works  
A. Sand B. gravel C. aggregate D. mortar
2. Which of the following materials are used for earthing system?  
A. Galvanized metal sheet B. copper rods C. Cu stranded wire D. All

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions



# **Solar PV System Installation and Maintenance Level II Learning Guide- 33**

<b>Unit of Competence: -</b>	<b>Prepare Construction Materials and Tools</b>
<b>Module Title: -</b>	<b>Preparing Construction Materials and Tools</b>
<b>LG Code:</b>	<b>EIS PIM2 M08LO2 LG-33</b>
<b>TTLM Code:</b>	<b>EIS PIM2 TTLM 0120 V1</b>

**LO 2: Receive and inspect materials**



Instruction Sheet	Learning Guide # 33
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics

- Identifying material requisition procedure
- Inspecting materials and tools
- Setting aside materials and tools nearest to the workplace

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 –

- Identify material requisition procedure
- Inspect materials and tools
- Set aside materials and tools nearest to the workplace

**Learning Instructions:-**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 4.
3. Read the information written in the information Sheet 1, Sheet 2, Sheet 3, Sheet 4, and Sheet 5 in pages 14, 18, 22, respectively.
4. Accomplish the Self-check 1, Self-check 2, Self-check 3, in pages 17, 22, 24, respectively



## Information Sheet-1

## Identifying Material requisition procedure

### 1.1. Identifying material requisition procedure

#### Introduction

A material requisition form lists the items to be picked from inventory and used in the production process or in the provision of a service to a customer, usually for a specific job. The form usually has three purposes:

- ✓ To pick items from stock
- ✓ To relieve the inventory records in the amount of the items picked
- ✓ To charge the targeted job for the cost of the items requisitioned

The form can also be used as the basis for the reordering of any inventory items that are not currently in stock

The information most commonly found on a material requisition form includes:

- ✓ Header section: Job number to be charged
- ✓ Header section: Date of requisition
- ✓ Header section: Date by which inventory is required
- ✓ Main body: Item number or description to be pulled from stock
- ✓ Main body: Unit quantity to be pulled from stock
- ✓ Footer section: Authorization signature line

If the materials are to be delivered to a specific location, there may also be space in the header in which to identify the delivery location.

Unless a service invoice is to be prepared from this document, it usually does not include item costs or prices

The requesting person retains a copy of the material requisition form, as does the warehouse staff. Another copy accompanies the picked goods to their eventual destination. If items listed on the form are not in stock, another copy may be sent to the purchasing department for ordering purposes

Auditors may trace the flow of material requisition forms through a company, to see if inventory items are being appropriately used and recorded as mandated by company materials handling



procedures. If not, the auditors may conclude that they cannot rely upon certain aspects of a company's control systems as part of their audit activities, and so will bolster other audit activities

The material requisition form is not used in a computerized production planning environment, where this picking information is instead sent to the warehouse as an electronic message.

A material requisition form may also be known as a purchase requisition form, though a purchase requisition can be used for all types of purchases, not just those involved in the production process.

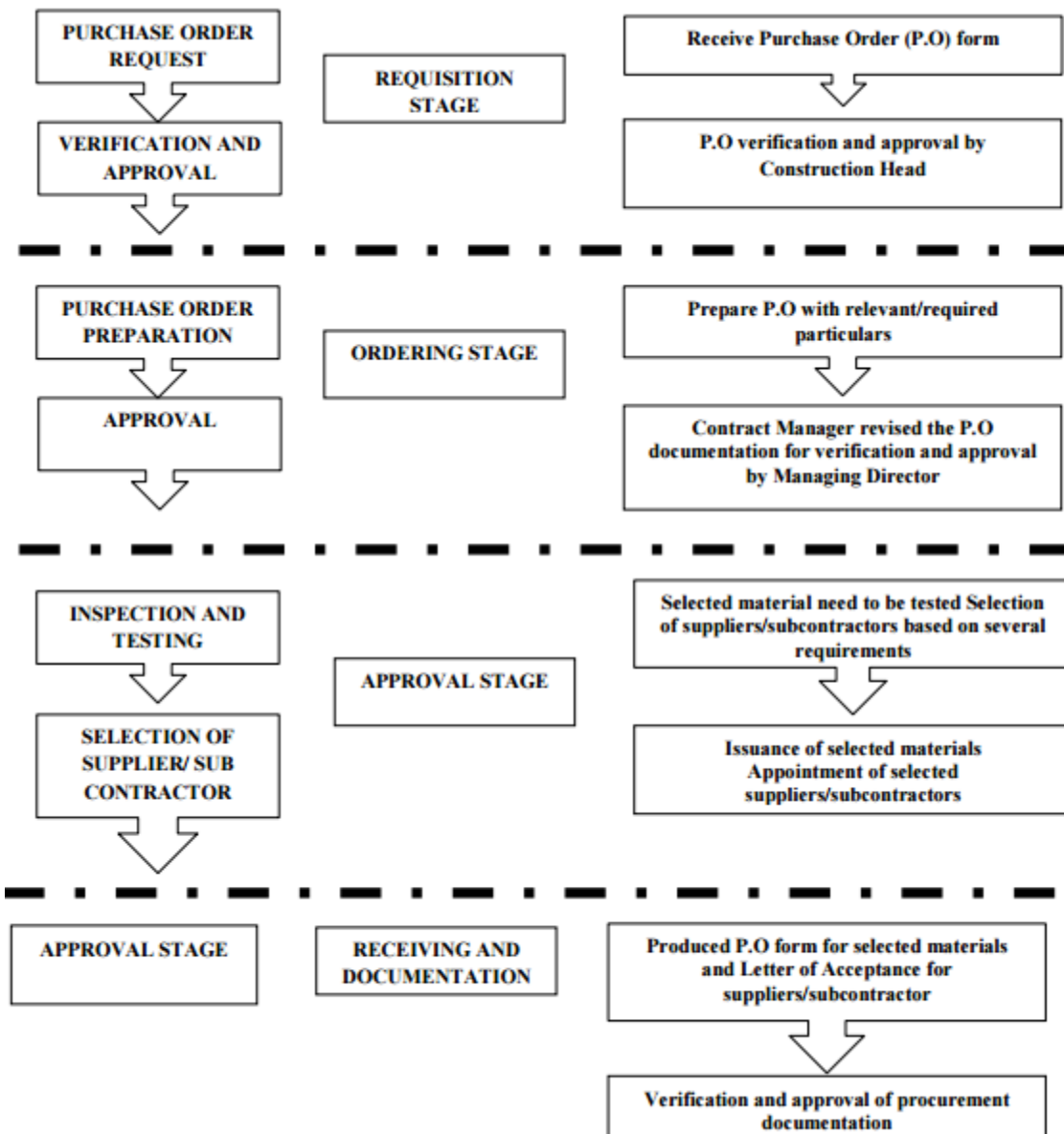


Fig. 1. Flow of material purchasing process

Fig 1. Elaborates the flow of material requisition process





Self-Check -1	Written Test
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**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page: each 3 marks

1. List three purposes of material requisition forms.
2. A material requisition form consists of  
A. Header B. main body C. footer D. all

#### Answer Sheet

**Note: Satisfactory rating - 3 points**

**Unsatisfactory - below 3 points**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score = \_\_\_\_\_

Rating: -----



## Information Sheet-2

## Inspect materials and tools

### 2.2. Inspecting materials and tools

Introduction;-

This introduction to solar construction safety provides information to help develop safe work practices for typical solar construction projects including both solar hot water and solar PV installations. In addition to this manual, attending ongoing and other safety courses can build proficiency in safe work practices.

They should never be pointed at anyone and should be inspected before each use of tools by construction workers for particularly important in construction work. They are primarily used to put things together (e.g., hammers and nail guns) or to take them apart (e.g., jackhammers and saws). Tools are often classified as hand tools and power tools.

A hand tool is any tool that is powered by hand rather than a motor. Categories of hand tools include wrenches, pliers, and cutters, files, striking tools, struck or hammered tools, screwdrivers, vises, clamps, snips, saws, drills and knives.

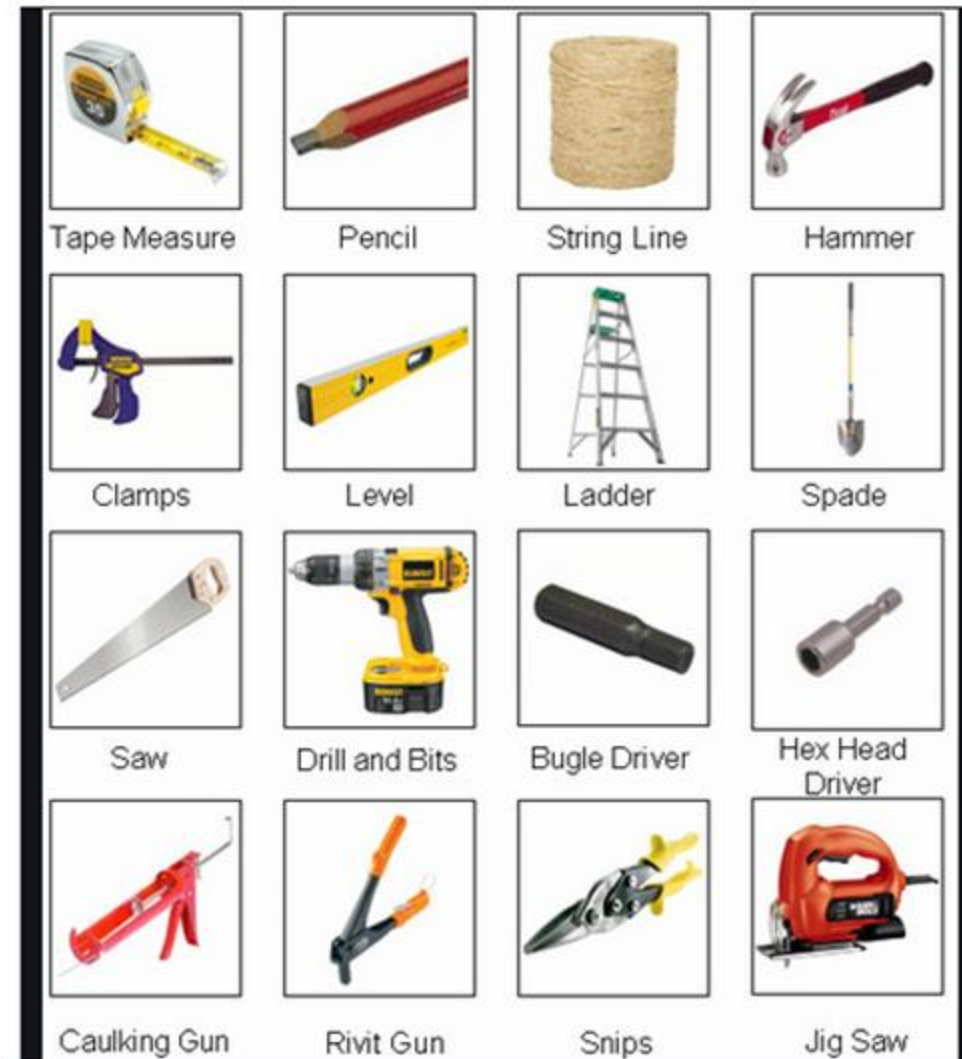
A power tool is a tool that is actuated by an additional power source and mechanism other than the solely manual labor used with hand tools. The most common types of power tools use electric motors. Internal combustion engines and compressed air are also commonly used. Other power sources include steam engines, direct burning of fuels and propellants, such as in powder-actuated tools, or eve.

Power tools include: Air compressor, Angle grinder, Band saw, Belt sander, Ceramic tile cutter, Chainsaw, Circular saw, Concrete saw, Crusher, Diamond blade, Diamond tool, Disc cutter, Disc sander, Drill, Floor sander, Impact wrench etc.

#### **Power tools replacing hand tools in Workshop**

We cannot replace almost all the hand tools with power tools in all the shops. But we can certainly use these tools in some shops and they are mainly in the Carpentry Shop and fitting shop. In carpentry shop student performed cutting of wood with different saws. planning of

wood with different planning tools, drilling with help of hand drill, bratchet brace or gimlet, to make curve with help of rasp file.



DESCRIPTION OF TOOLS:-Lumber sawn lumber, Nails-made of metal used for fastening woods,

- Lumber -sawn lumber
- Nails - made of metal used for fastening woods
- Plywood - thin cross laminated sheet of wood
- Gravel - coarse aggregate
- Pull-push-rule - used for measuring long distances





## Self-Check -2

## Choose the best answer

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Made of metal used for fastening woods is;-

A, Plywood    B, Gravel    C, Nails    D, sawn lumber

2. Which one of Level indicator



A,



B.



C,



D

3. Which tools is used to cut the tin are

A, saw    B, snips    C, jig saw    D, clamps

**Note:** Satisfactory rating - 3 points

Unsatisfactory - below 3 points

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions



<b>Information Sheet-3</b>	<b>Setting aside materials and tools</b>
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### 3.1 Setting aside materials and tools nearest to the workplace

Introduction;-

An ideal workshop does not exist. Each worker has its own unique interests and needs; a number of limiting factors affects the set-up of workshop. The most important thing is to create a workshop that will suit your needs and work habits in the best possible way and to equip your workshop with hand tools, power tools and machines that you need for the work.

Proper tools and equipment are essential for the effective operation of any civil works site. the construction site with the correct tools and equipment plays an essential role in achieving timely and good quality results.

You should plan the arrangement of the materials and tools to ensure enough space to maneuver

- The number of materials, tools and accessories (e.g. sawhorses, benches...)
- Consider the number of users of the tools and devices in the workshop
- Making a good arrangement of tools and accessories with arrangement models.

This is very important when planning the space requirements, size of the tools and equipments. Storage space for materials and finished products, space for storing tools and accessories and other materials for processing, and the storage of finished products.



# TOOLS & EQUIPMENT







**Self-Check -3,**

**Written Test**

**Directions:** Write true or False

Each 3 marks

1. Proper tools and equipment are essential for the effective operation of any civil works site.
2. Hand tools and power tools will be mixed in the arrangement.

**Note:** Satisfactory rating - 5 points

**Unsatisfactory - below 5 points**

**Answer Sheet**

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Short Answer Questions**





# **Solar PV System Installation and Maintenance**

## **Level II**

# **Learning Guide-34**

<b>Unit of Competence</b>	<b>Prepare Construction Materials and Tools</b>
<b>Module Title</b>	<b>Preparing Construction Materials and Tools</b>
<b>LG Code</b>	<b>EIS PIM2 M08 LO3 LG-34</b>
<b>TTLM Code</b>	<b>EIS PIM2 TTLM 0120 v1</b>

## **LO3: Maintain Tools and Equipment**



<b>Instruction Sheet</b>	<b>Learning Guide -34</b>
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This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- 
- Maintaining and storing tools and equipment
- Company standard procedures
- .Disposing tools and equipment eco friendly
- Keeping and documenting records of materials

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:

- Maintain and storing tools and equipment
- Company standard procedures
- .Dispose tools and equipment eco friendly
- Keep and documenting records of materials

### **Learning Instructions:-**

Read the specific objectives of this Learning Guide.

Follow the instructions described below 3 to 4.

Read the information written in the information Sheet 1, Sheet 2, Sheet 3, Sheet 4, in pages 27, 33, 36, 40 respectively.

Accomplish the Self-check 1, Self-check 2, Self-check 3, Self-check 4, in pages 32, 35, 39, 42 respectively



## Information Sheet-1

## Maintaining and storing tools and equipment

### 3.1 Maintaining and storing tools and equipment

#### Introduction

Handling and storing materials involve diverse operations such as hoisting tons of steel with a crane, driving a truck loaded with concrete blocks, carrying bags or materials manually; and stacking palletized bricks or other materials such as drums, barrels, kegs, and lumber.

The efficient handling and storing of materials are vital to industry. In addition to raw materials, these operations provide a continuous flow of parts and assemble through the workplace and ensure that materials are available when needed. The improper handling and storing of materials often result in costly injuries.

#### Moving, handling and storing materials

The general safety principles such as proper work practices, equipment, and controls can help reduce workplace accidents involving the moving, handling, and storing of materials. Moving materials manually or mechanically may produce hazards associated with the task at hand and apply measures how to control their workplaces to minimize the danger. Workers should be able to recognize the methods for eliminating or at least minimizing the occurrence of such accidents. Workers should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.

#### The potential hazards for workers

Workers frequently cite the weight and bulkiness of objects that they lift as major contributing factors to their back injuries resulting from bending, followed by twisting and turning, were the more commonly cited movements.

Other hazards include falling objects, improperly stacked materials, and various types of equipment. You should make your employees aware of potential injuries that can occur when manually moving materials, including the following.



- Strains and sprains from lifting loads improperly or from carrying loads that are either too large or too heavy,
- Fractures and bruises caused by being struck by materials or by being caught in pinch points, and
- Cuts and bruises caused by falling materials that have been improperly stored or by incorrectly cutting ties or other securing devices.

### **What precautions should workers take when moving materials manually?**

When moving materials manually, workers should attach handles or holders to loads. In addition, workers should always wear appropriate personal protective equipment and use proper lifting techniques. To prevent injury from oversized loads, workers should seek help in the following:

- When a load is so bulky that employees cannot properly grasp or lift it,
- When employees cannot see around or over a load, or
- When employees cannot safely handle a load.

Using the following personal protective equipment prevents needless injuries when manually moving materials:

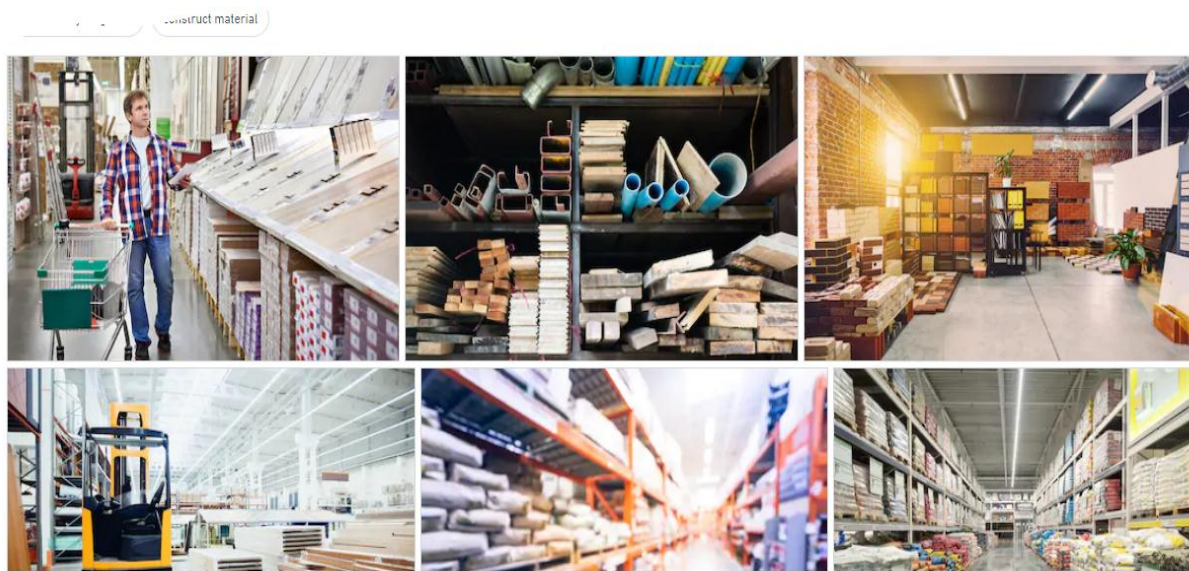
- Hand and forearm protection, such as gloves, for loads with sharp or rough edges.
- Eye protection.
- Steel-toed safety shoes or boots.
- Metal, fiber, or plastic metatarsal guards to protect the instep area from impact or compression

Storage equipment is any equipment used for holding or buffering materials over a period of time (and may include transport) typically they help preserve valuable work floor space.

The contractor is responsible for making sure that all tools and equipment are well organized and maintained in good working condition. They should be stored in a separate, secure place so that they are safe and easy to find. This is usually best done in a place which is separate from the office. Lost tools are expensive to replace and much time can be wasted if they are not available and ready to use when needed. It is usual for those who have responsibility for looking after tools, equipment and materials to keep an inventory

(list) of these things. the store man should check off the inventory regularly and if any items have been loaned out and not returned, he/she must get them back. Breakages and losses and materials which have been used up should be reported to the community council administration and requests made to replace them. It is a good idea to have a tool box equipped with the necessary plumbing tools and materials (washers, thread tape, O-rings) ready to be picked up and taken to a job.

Figure 1. Solar PV construction Store house



If maintenance is needed, it's important to keep a comprehensive record - whether scheduled or unscheduled - to help you understand the importance of your equipment's upkeep works.

Table1 The benefits of keeping maintenance record

Prevent expensive repair works from happening	<ul style="list-style-type: none"> <li>• Performing routine inspections allow you to see and repair small damages before they become a big problem.</li> <li>• Documenting these inspections and small repairs help you keep track of all the maintenance work that your equipment has undertaken,</li> <li>• ensuring that each machine is in tip-top shape before putting</li> </ul>
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	them to work.
create specialized maintenance programs	<ul style="list-style-type: none"> <li>• With the help of routine check-ups, determine and record the differences of each individual equipment with regards to maintenance works</li> <li>• Creating maintenance programs specifically catering to each individual equipment on your fleet.</li> </ul>
Prevent problems regarding warranty claims	<ul style="list-style-type: none"> <li>• Documenting every repair or maintenance work done on your equipment will help you process warranty claims much easier</li> <li>• Keep a record of the type of maintenance work done to your equipment as well as the exact time and date</li> </ul>
Increases the safety of operators	<ul style="list-style-type: none"> <li>• The risk of accidents occurring due to malfunctioning machinery is reduced and as a result the operator is not affected.</li> <li>• Keep track of your machinery's health through documenting an equipment's maintenance history facilitating the inspection schedule when needed</li> </ul>
Track who is accountable for a piece of equipment	<ul style="list-style-type: none"> <li>• Perform a routine inspection and document the findings after every project will help you track down who is accountable for any damage inflicted on your machinery</li> <li>• One machine might have multiple operators.. Keeping these types of records will also encourage operators to take better care of the equipment</li> </ul>
Increases the resale value of the equipment	<ul style="list-style-type: none"> <li>• Keeping a detailed record of all the maintenance and repairs that a piece of equipment went through will help increase its resale value.</li> <li>• Present potential buyers a document of your equipment's maintenance history lets them know that the equipment they are planning to buy have been well taken care of</li> </ul>



- General requirements for equipment maintenance include:
  - ✓ Obtaining a copy of the maintenance schedule recommended by the manufacturer.
  - ✓ Ensuring that maintenance is performed as required.
  - ✓ Ensuring that the person(s) performing the maintenance are competent (e.g. licensed mechanic).
  - ✓ Retaining records of maintenance/service conducted.
  - ✓ Specifying who is responsible for overseeing equipment maintenance and where the records are kept.
  - ✓ Set up a system for removal and tagging of damaged or defective tools and equipment.





## Self-Check -1

## Written Test

### Choose the best answer from the given alternative

1. Which one is odd from the following?
  - A. Prevent problems regarding warranty claims
  - B. Prevent expensive repair works from happening
  - C. Helps you create specialized maintenance programs
  - D. None
2. \_\_\_\_\_ is any equipment used for holding or buffering materials over a period of time
  - A. Store
  - B. Equipment
  - C. Materials
  - D. boundary

**Note: Satisfactory rating 1.5 and above points Unsatisfactory - below 1 points**

### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Short Answer Questions





Information Sheet-2	Company standard procedures
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Imagine for a moment that you work in the customer service department at a grocery store. A customer comes in one day and says they need to return a bag of bread. Most likely, the store you work for already has a set of written rules in place for how to handle this situation. That written set of rules is what is known as a standard operating procedure.

Freedom without rules doesn't work. And communities do not work unless they are regulated by etiquette.

Standard operating procedures are written, step-by-step instructions that describe how to perform a routine activity. Employees should complete them in the exact same way every time so that the business can remain consistent. Standard operating procedures help maintain safety and efficiency for departments such as:

- Production/operations
- Sales and customer service
- Employee training
- Legal
- Financial

A standing operating procedure should never be difficult to read or vaguely worded. It should be brief, easy to understand and contain actions steps that are simple follow. A good standard operating procedure should clearly outline the steps and inform the employee of any safety concerns.

The standing operating procedures should be the basis for training any new employees. They should also be updated every year to ensure they stay relevant to the current needs of the organization.

Some business owners have a hard time grasping why standard operating procedures are necessary. They already trained their employees so why do they need a written document outlining the process as well?

Here are just a few of the reasons why your business needs standard operating procedures



### **1. Save time and money**

When the same task is completed in many different ways, it will always take longer to complete. Having a standard operating procedure in place streamlines the process so employees can accomplish more in less time.

### **2. They provide consistency**

Having a standard operating procedure in place ensures that regardless of who is working, business processes are being completed the correct way.

### **3. They improve communication**

Standard operating procedures make your employees' jobs easier because no longer do they have to guess as to how they should be performing their jobs. And they don't have to try to rack their brains to remember what you told them when they were first hired.

### **4. They allow you to hold your employees accountable**

How can you evaluate your employees if you don't have written standards in place? Without standard operating procedures, employee evaluations become a matter of personal opinion, which is hardly fair to your employees.

### **5. They create a safer work environment**

When employees perform the same tasks in completely different ways, it is not only inefficient it is actually a liability for your business. Standard operating procedures ensure that employees perform their job functions in a safe and consistent manner.

One of the biggest misconceptions about standard operating procedures is that they will cause businesses to become rigid and inflexible. This article in the Harvard business review does a great job of explaining how having systems in place for employees to follow actually makes businesses more flexible.



### Self-Check -2

### Written Test

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page: each 3 points

#### Say true or false

1. A standing operating procedure should never be difficult to read or vaguely Worded.
2. Standard operating procedures make your employees' jobs easier.
3. Standard operating procedures are written, step-by-step instructions that describe how to perform a routine activity.

**Note:** Satisfactory rating – 5      Unsatisfactory - below 3 point

#### Answer Sheet

Score = \_\_\_\_\_

Rating: \_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_

#### Short Answer Questions



<b>Information Sheet-3</b>	<b>Disposing tools and equipment eco friendly</b>
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### **3.2 Disposing tools and equipment eco friendly**

Office buildings, schools, stores, hotels, restaurants and other commercial and institutional buildings generate significant amounts of materials and waste. Here are tools and resources to help facility managers, building owners, tenants and other stakeholders improve waste management in their buildings, reduce costs and enhance sustainability.

#### **Advantages and Disadvantages of Recycling**

Recycling is considered as one of the best solutions to reduce garbage output and its impact on the environment. But although its definition is simple, which is re-using old or waste products or turning them into something completely new, getting it done is anything but. What is even more shocking, however, is that recycling is not all good. Although it helps reduce energy usage, consumption of raw materials, and air and water pollution, it does have its drawbacks.

#### **Advantages of Recycling**

##### **1. Environmental conservation and protection.**

The continuous use of paper means trees are cut down continually, but not when paper made from certain trees are re-used repeatedly. This will help minimize deforestation or felling. Along with the production of paper from sustainable trees, forests can be preserved before they are completely wiped out.

Considering that trees help prevent floods, provide raw materials and nourishment, and improve air, we need to keep as many of them around as possible. If other natural resources can be reused in the same way, the environment and everyone relying on it would greatly benefit.

##### **2. Reduce consumption of energy.**

Transporting raw materials involves the use of energy, and a huge one at that. Processing raw materials also requires a significant amount of energy to get from source to destination. Put them together and the level of energy consumption just adds up. So why not recycle? Recycling



paper consumes less energy than processing trees. The same thing it's true when recycling or re-purposing wood.

### **3. Reduce air and water pollution**

A major source of pollution today is industrial waste that comes from factories producing plastics and cans. If both products are re-used, instead of manufactured from scratch repeatedly, pollution can be reduced significantly. Recycling also promotes responsible and proper management and disposal of plastics and cans.

### **4. Global warming mitigation.**

Production of plastic cans and other items can involve burning massive waste that will lead to greenhouse gas emissions at staggering amount. Considering the effects of global warming, doing anything possible to mitigate them would be very beneficial. This includes recycling to keep the process of burning at a minimum, and reduce waste generation. Converting waste into useful and eco-friendly products would also help mitigate harmful environmental impacts.

### **5. Limit waste in landfills**

A majority of non-biodegradable products all over the world are thrown in landfills. As they take years or decades to decompose, landfills would not only be filled, literally, but also overflowing. This results in pollution, environmental problems and contamination of water and its surrounding areas, especially because overflowing rubbish can reach the oceans. Waste in landfills will also seep through soil and contaminate it. Through recycling, whatever problems associated with landfills will be addressed.

Spreads environmental awareness

With calls to sort waste into biodegradable, non-biodegradable and recyclable, people become aware of recycling, educating them of its importance, while reducing environmental impact at the same time. When everyone becomes accustomed to recycling, people will be more eco-conscious and more participative of eco-friendly activities.

### **7. Make and save money**

Electronics, old water bottles, and other trash can be sold for cash. So if you sell them, you not only save the environment, but make money as well. If you buy recycled materials which costs less than the new ones, you will also save money. The more money you will make and save if you re-use some of the trash that your home produces.



### ➤ Waste Prevention

The most effective way to reduce your organization's waste is to generate less in the first place. Waste prevention offers the greatest environmental benefits and cost savings.

- **Reduce:** Organizations can modify their current practices to reduce the amounts of waste generated by changing the design, manufacture, purchase, or use of materials or products. For example, your organization could encourage employees to only print what they need and ensure that printer settings are defaulted to print double sided to save paper.
- **Reuse:** Reuse of products and packaging prolongs the useful life of these materials, thus delaying final disposal or recycling. Reuse is the repair, refurbishing, washing, or just simple recovery of worn or used products, appliances, furniture and building materials. For example, by encouraging occupants to use reusable coffee mugs rather than single-use, disposable cups, you don't have to manage the disposal of a bunch of coffee cups.
- **Donate:** Organizations can donate products or materials to others who need and can use the items. For example, restaurants, hotels and cafeterias promptly distribute perishable and prepared foods to hungry people in their communities. Many local food banks will pick up food donations free of charge, saving you storage and disposal costs.



### Self-Check -3

### Written Test

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

#### Say true or False

1. Recycling is considered as one of the best solutions to reduce garbage output and its impact on the environment.
2. Production of plastic cans and other items can involve burning massive waste.
3. the most effective way to reduce your organization's waste is to generate less in the first place.

**Note:** Satisfactory rating – 2 points

Unsatisfactory - below 2 points

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

#### Answer Sheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

#### Short Answer Questions

Score = \_\_\_\_\_

Rating: \_\_\_\_\_



#### Information Sheet-4

#### Keeping and documenting records of materials

### 4.1 Keeping and documenting records of materials

The term “record keeping” refers to the orderly and disciplined practice of storing business records. Record keeping is one of your most important responsibilities as a small business owner. The success of your business depends on creating and maintaining an effective record system, whether your business is a sole proprietorship, partnership, or corporation. Record keeping ranges from simple manila folder filing systems to complex on-line electronic systems. Whether simple or complex, a record keeping system must be easy to use and provide adequate storage and retrieval of records. Most importantly, the record keeping system you choose must be suited to your particular business needs. The type, size, and complexity of your business, as well as your business’ available resources, will help to determine the record keeping system best suited to you and your business

#### ➤ Reasons for Keeping Good Records

Record keeping is not solely about fulfilling regulations or legal requirements. Record keeping is also about understanding your business, now and in the future. Reasons why you should keep good records include:

- ✓ Detail Tracking
- ✓ Planning
- ✓ Legal compliance
- ✓ Tax preparation

Let’s go through each of these reasons in further detail.

- ✓ Detail tracking owning a small business will require you to track a significant amount of information, such as customers, sales, and inventory. Without a proper record keeping system, you may lose sight of important business details, leading to problems with serving your customers. If you do not know details about your customers, such as who your customers are and what your customers like, your business may not be able to meet





buyer demands. You risk disappointing a customer, maybe losing that customer forever. Staying informed of customers, their orders, and the inventory to provide for their purchases is challenging. Without a proper record keeping system, tracking important details of your business may be impossible.

- ✓ Planning Proper record keeping helps to plan your business' future. How does a business owner who fails to track his customers determine inventory needs for the next quarter, year, or longer for example, what if you own a clothing store. Clothing store owners must anticipate the need for inventory throughout the year, due to seasonal cycles.
- ✓ **Legal Compliance:** As an owner, you will likely execute contracts and be required to hold various licenses and permits. As an employer, you will be required to maintain and report employee payroll for tax purposes. These three categories of legal compliance are discussed in further detail a little later:
- ✓ **Tax (Federal, State, and Local) Preparation**  
A well maintained record keeping system ensures that you are able to keep up with tax reporting requirements. For example, if you are an individual small business owner or contractor, then you are generally considered self-employed. Self-employed owners file a personal income tax return annually and pay estimated tax quarterly



### Self-Check -4

### Written Test

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

**Choose the best answer from the following alternatives**

1. Which of the following are reasons for keeping good records?

- A. Business detail tracking
- B. Planning
- C. Legal compliance
- D. Tax Preparation
- E. all

2. When creating a record keeping system, it's a good idea to

- A. Wait until enough information is available to get started.
- B. Start simple and refine later.
- C. Get a sophisticated system to anticipate future needs.
- D. Start after one year of operations.

3. Which of the following should be done before purchasing business software

- A. Create an information technology (IT) department
- B. Get a business credit card
- C. Evaluate your business needs
- D. Consult with the Internal Revenue Service (IRS)



## REFERENCE

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- **WEB ADDRESSES**

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